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I.

NASAL TUBERCULOSIS: TWO CASES, ONE INVOLVING THE RIGHT ETHMOID BONE, WITH RECOVERY AFTER OPERATION.*

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The account of my own cases is preceded in this paper by a short composite description of nasal tuberculosis obtained from its literature; articles on lupus, because of the proof of its tubercular nature, being also considered. The writings to which I am the most indebted are P. H. Gerber's clear and full description of nasal tuberculosis in *Heymann's Handbuch,* and Koschier's remarkable series of articles, including many case reports of his own observation, in the *Wiener klinische Wochenschrift* in 1895. In addition to these, two more detailed descriptions, Herzog's paper in the *American Journal of*

*Read at the thirty-first annual meeting of the American Laryngological Association, Boston, 1909.

Medical Sciences in 1893, Gleitsmann's admirable article on tuberculosis of the accessory sinuses in the *Laryngoscope* for 1907, and a number of other articles mentioned in the literature list have proved of great value.

Designation.—Custom still retains the name lupus for the group of cases of nasal tuberculosis possessing special features which were thought to make them a distinct disease called lupus before the identity of tuberculosis and lupus was established. For the sake of a clear understanding of the matter, I have therefore sought out from the literature what are regarded as the distinguishing characteristics of lupus and nasal tuberculosis proper.

Lupus is a form of nasal tuberculosis commonly occurring at the age of puberty, and in women, while ordinary nasal tuberculosis usually occurs between the ages of twenty-five and sixty, and is as frequent in males as in females.

Lupus is a primary form of nasal tuberculosis of an exceedingly slow course, extending at times over decades. It may remain the only evidence of tuberculosis in the body, generally leading late, if at all, to secondary tubercular deposits.

Nasal tuberculosis is more rapid, and less benignant, than lupus, is often secondary to another tubercular focus, especially pulmonary tuberculosis, and, if primary, is disposed to an earlier creation of other tubercular affections than lupus.

Lupus appears in the form of granulations and diffuse infiltrations which, instead of breaking down readily, have a tendency to cicatricial metamorphosis, so that the disease heals by scar formation in some places, while progressing in others. The tubercular tissue in lupus advances superficially in the mucosa and invades cartilage and bone late, if at all, in its course.

In contradistinction to this, the granulation tissue of nasal tuberculosis in most cases breaks down early by cheesy degeneration and produces ulcerations of a more or less destructive character, which are disposed to attack cartilage and bone at an earlier stage than lupus, while cicatrization does not occur.

Granulation tumors, often of considerable size, are occasionally found in nasal tuberculosis, but are not found in lupus.

Lupus, even when at first intranasal, is apt to extend to the skin of the external nose, lips and face. Nasal tuberculosis, on the other hand, commonly stays within the nasal interior.

Histologically the lupus nodule is a miliary tubercle; but usually, instead of disintegrating by cheesy degeneration, disappears by cicatrization, while the tubercle of nasal tuberculosis undergoes the central caseation and destructive softening characteristic of the typical miliary tubercle.

In short, the term lupus may be used to designate the well-known type of mild, slow, cicatrizing tuberculosis which resembles the fibrous type of pulmonary phthisis and which is less apt to destroy the structure it invades than to replace it with connective tissue. In contradistinction to this, ordinary nasal tuberculosis shows the tendency to caseation and breaking down without repair characteristic of the more virulent forms of tuberculosis. The large proportion of cases of the milder lupus form of tuberculosis in the nose indicates a vigorous resistance of its structure to tubercular infection.

So long as the disease remains intranasal it will always be difficult, because of the many cases showing mixed characteristics of both lupus and tuberculosis, to tell to which of the two disease groups a given case should be assigned. But, as the affections are etiologically one, and differ merely in respect to prognosis and pathologic changes, the distinction is not of great importance.

Etiology.—The opinion prevails that the usual beginning of both lupus and nasal tuberculosis on the foremost part of the septum is an evidence that the tubercle bacillus finds lodgment in the nose as the result of direct inoculation; for the surface of the cartilaginous septum is especially subject to the impact of particles in the air current, to friction with the handkerchief and to abrasions and eczematous conditions due to this friction, and to picking the nose. In fact, Massei thinks that the establishment of the disease in the usual site at the front of the septum is often caused by direct inoculation of the mucosa with the finger nail contaminated with tubercle bacilli.

Hematogenous conveyance of the bacilli into the nasal tissues is thought possible in rare instances.

While the authorities concede that absolute proof that a tubercular affection is primary is to be supplied only by an autopsy, it is nevertheless agreed that the course of almost all cases of lupus and of many cases of nasal tuberculosis indicates a primary tubercular lesion.

The rarity of tuberculosis of the nasal passages, in spite of

their exposure to inhalation infection, is explained, though but theoretically and without experimental basis, as due to the bactericidal qualities of the nasal mucus, the ejecting action of the cilia of the epithelium and the protective presence of a subepithelial adenoid layer of cells.

Appearances and Symptoms.—Nasal tuberculosis is divided according to its aspect into four forms: the tubercular ulcer, the tubercular tumor or tuberculoma, the diffuse infiltration and the formation of granulation areas, the latter being the variety characteristic of lupus.

The Tubercular Ulcer.—In this group of cases, to which belong most of those secondary to pulmonary or laryngeal phthisis, ulceration is the chief characteristic of the affection. The tubercular infiltration which precedes the ulcer is rarely seen, as it creates no symptoms, the first thing ordinarily discovered being the fully developed ulcer, which makes its presence known by producing obstructing scabs in the affected naris.

When cleansed of these scabs the ulcer, in its early stage, is usually found to be solitary and to be seated upon the anterior part of the cartilaginous septum. Its form is round, oval or irregularly gnawed out and scalloped. Its floor is rarely clean, being usually covered by a yellowish thin false membrane, out of which sprouting, fungous, pale granulations arise. The tissue surrounding the ulceration is seldom congested, may even be pale, and is commonly invaded and thickened by tubercular infiltration of varying extent. The borders of the ulcer may be steep, but are usually shallow, and in almost all instances so ill-defined that it is impossible to tell exactly where, beyond the ulcer, the intact epithelium begins, so much is it fretted by minute ulcerations scattered about the ragged edge of the central ulceration.

While small nodular collections of miliary tubercles studding the mucous membrane about the tubercular ulcer are commonly described as a characteristic aspect, I could see nothing of the sort in my two cases of nasal tuberculosis, nor have I so often met with this condition in the neighborhood of tubercular ulcers of mucous membranes elsewhere that it seems to me at all a usual feature, and I think that its description as typical represents text-book tradition rather than actuality.

While the tubercular ulcer is seldom rapidly destructive and

is usually slow to invade cartilage and bone, still in the course of time it produces perforations of the septum and caries of its skeleton.

In spreading beyond its usual site on the septum the ulceration commonly progresses across the nasal floor to the inferior turbinated bodies.

The Tubercular Tumor.—This is usually solitary, and, like the other forms of nasal tuberculosis, often appears upon the cartilaginous septum, and next in frequency upon the inferior turbinated body. It varies in size from the bulk of a pea to growths large enough to be mistaken for sarcoma, as occurred in a case which came to my knowledge. Herrmann Coenen describes a tuberculoma so large that it filled the right nasal fossa, forced over the septum, infiltrated the hard palate and required extensive resection of the bones of the nasal skeleton for its removal. After the operation the patient died of septic pneumonia, the autopsy showing primary nasal tuberculosis. Rucda also reports a large tuberculoma weighing thirty-five grams.

A nasal tuberculoma may be spherical or lobulated, may have a papillomatous, smooth, or irregular surface, and may be pedunculated; but it has usually a broad base. Its color is grayish red, or dark red, or whitish. Characteristic of tubercular tumors are their friability and their tendency to ulcerate.

The Tubercular Infiltration.—This variety, like the edematous form of laryngeal phthisis, with its deep-seated tubercular infiltration of the submucosa and perichondrium of the larynx, produces diffuse swelling of the part in the nose attacked, which is usually the cartilaginous septum, the skeleton of this structure as well as the mucosa being invaded by the tubercular granulations. Entering thus deeply into the framework of the septum, the disease expands it in the form of diffuse, pale pink, resistant swellings whose surface may show sprouting granulations or ulceration in some places, while remaining smooth in others. In marked cases the thickened septum may appear like a tumor filling both nares and feel like a hard lump when the external nose is grasped. Later carious breaking down of the infiltration often leads to multiple perforations of the septum and extensive destruction of its skeleton. The disease is apt to advance into the external nose from underneath, causing it to thicken and broaden.

The tubercular infiltration in its more superficial and less destructive forms approaches lupus in character. When actively progressing it is the most formidable variety of nasal tuberculosis.

Proliferation of Granulations.—The form of intranasal tuberculosis typical of lupus is the granulating area upon the mucous membrane. It commonly begins, as do the other varieties, upon the cartilaginous septum and appears as a bed of grayish red granulations, producing a surface like that of a raspberry, generally hidden by scabs. Later in the disease the granulations also appear upon the lower turbinated bodies.

This is the most benignant of the varieties of nasal tuberculosis. While it may lead to perforations of the cartilaginous septum, it is not its nature to enter deeply into the structures it occupies, and it progresses superficially over increasing areas of the mucosa and commonly later also over the skin of the external nose. Its tendency to form cicatrices may narrow the external nostrils.

In addition to the typical forms described, Koschier mentions a case of nasal tuberculosis having an exceptional primary deep beginning in the bones of the septum and inferior turbinated bodies invading the mucous membrane from beneath.

The symptoms caused by nasal tuberculosis are mainly scabbing, due to drying of the scanty secretion from ulcerated and granulating surfaces, and nasal obstruction.

Pathologic Histology.—Microscopic sections of the tissue attacked and of the tumor formations show a diffuse infiltration of lymphoid and epithelioid cells traversed by connective tissue bands, with often so great a scarcity of typical miliary tubercles and isolated giant cells that many sections may need to be examined before these objects are discovered. Tubercle bacilli are generally rare, are most frequent in the deeper parts of the products of the disease, and are often not to be discovered in tissue typically tubercular.

Diagnosis.—While the most important means of establishing the diagnosis is a histologic examination of excised tissue, the microscopic findings may nevertheless be doubtful, because of the rarity of elements distinctly tubercular in the specimen examined. Typical miliary tubercles with a center of cheesy degeneration and giant cells may be regarded as pathognomonic, even if bacilli be not found, but, as shown by Max

Goerke, giant cells alone do not prove the existence of tuberculosis, as they are also found in the products of tertiary syphilis and as the result of the entrance of minute foreign bodies into the tissues. Both of these conditions may, however, usually be excluded clinically, and the history of the case, its gross appearances, and the finding of giant cells in fields of epithelioid and lymphoid cells, establish the diagnosis with sufficient certainty, even though typical tubercles and bacilli be not found in the sections.

The inoculation of suspected tissue into animals remains equivocal, even if they become tubercular, as it is impossible to exclude contamination of the specimen employed with tubercle bacilli accidentally present in the nares.

The mere gross appearances may be deceptive, as I found in the case of a young man with extensive and obstinate ulcerations and large areas of granulations on the septum and inferior turbinated body, the aspect of the affection being so much like tubercular ulceration that I was surprised when repeated microscopic examinations showed an almost pure culture of influenza bacilli in the false membrane removed from the surface of the ulcers and simple inflammatory ulceration in the tissue examined microscopically. In spite of the comparatively innocent infection in this case, mild measures were of no avail, and excision of the diseased mucosa on the septum and resection of the lower turbinate were necessary to effect a cure.

Syphilitic ulceration and hyperplasia are usually attended with extensive necrosis of bone, the formation of large sequestra and putrid discharge. In contradistinction to this, where destruction of bone and cartilage occurs in nasal tuberculosis it is by insensible softening and carious absorption by the advancing granulation tissue without fetor or the formation of a sequestrum.

Prognosis.—Nasal tuberculosis is commonly a benignant and often primary form of tuberculosis in a tissue little susceptible to the disease and permitting but few bacilli to penetrate it. If, therefore, the tissue invaded can be completely removed, recovery without a relapse is a possibility. Even in lupus, and still more in common nasal tuberculosis, secondary deposits in the form of pulmonary tuberculosis, tubercular meningitis, tubercular lymphomata, joint disease or some other form of tuberculosis are to be feared so long as the primary affection in the nose is not extirpated.

Treatment.—The structures forming the nasal cavity are not of vital, or the highest, functional importance, and are comparatively accessible, and for this reason, as compared to its location in other organs, primary tubercular disease within the nose is somewhat favorably situated for the thorough surgical extirpation which its dangerous and obstinate nature demands as the treatment of choice, in case it be deemed feasible. As compared to surgical excision all of the other methods of treating nasal tuberculosis are far less certain in their results, some being but vaguely experimental, and they are justifiable only where the extensions of the disease have gone so far that its surgical removal involves great disfigurement, such as the sacrifice of the external nose, or where these extensions have entered regions whence they cannot be removed by operation with the preservation of life.

The best implements for the excision of the tubercular products are those which cut them out as cleanly as possible: rounded knife blades, chisel-shaped blades, the punch forceps and, merely as an adjuvant, the sharp spoon. The latter implement is often described as being the main reliance for the removal of the tubercular tissue. Its action is, however, too circumscribed and inaccurate. It leaves torn shreds of flesh behind, and cannot cut away the apparently healthy, but suspicious, zone about the tubercular granulations or ulcer which it is absolutely necessary to remove in order to diminish the likelihood of recurrence. Even a careful excision will, of course, not insure against a reappearance of the disease somewhere in the nose; for the least remnant of tubercular tissue left will reproduce the disease, and in such instances, as in my first case, the tubercular granulations must be followed by secondary operations until they no longer return.

The measures which may be employed where the disease is beyond operation, as in my second case, are the excision of obstructing masses of tubercular tissue as far as possible, curettement followed by lactic acid, tuberculin, Holländer's destruction of tubercular tissue by superheated air, the galvanocautery and the X-ray. Massei states that electrolysis has not become popular, and that long trials of phototherapy have proved ineffective.

As mentioned by Massei, extensive operations on the bony skeleton of the facial nose, opening it widely, are often need-

lessly employed to make intranasal tuberculosis accessible for curettement or for its removal in other ways, where an operation through the nostrils would have given ample access.

My first patient was a young woman of twenty, first seen on September 5th, 1907. Her chief symptom was an odorless, mucopurulent discharge, tending to dry into scabs, and coming from the right nostril, which had been constantly more or less obstructed since the condition began, in March, 1906.

Inspection showed the left naris to be normal. In the right an elevated, cockscomb-like ledge of pale pink granulations could be seen upon the septum, beginning in front opposite the anterior end of the middle turbinated body and following the septum clear to its posterior border, where it could be seen by posterior rhinoscopy, projecting into the nasopharynx as an irregular, superficially ulcerated, whitish tumor, of the size of a hazel-nut. (Fig. 1.) Back of its posterior third the middle turbinated body was involved in the disease, the granulations bridging and filling the space between it and the septum, as could be seen by both anterior and posterior rhinoscopy.

On September 27th, 1907, the diseased outgrowth was removed from the posterior border of the septum by an angular blade which hooked behind it and cut up and down, while a probe in the left nostril pushed the mass over into the right to steady it. The granulating area on the right side of the septum was then dissected off to the cartilage and bone by means of one of my sharp elevators used in the submucous resection. This procedure radically extirpated the tubercular tissue from the septum, and no recurrence ever took place on this structure.

The middle turbinated body was then resected along its whole length with one of my septum knives, its tissue cutting readily, owing to carious absorption of the bone by the tubercular granulations. The stump was then trimmed with the Grünwald-Hartmann punch forceps until all the disease seemed removed.

Microscopic examination of the tissue showed abundant giant cells embedded in fields of epithelioid cells; but no tubercles or bacilli were found at this time.

The denuded area healed promptly, but scabbing began again after some weeks in the region of the stump of the middle turbinated body, from which pale polypoid granulations were seen to be again sprouting. On November 25th, there-

fore, all but a posterior remnant of the stump of the middle turbinated body was extirpated with what tissue seemed to be tubercular. Again the disease seemed eradicated, until, in January, scabbing recommenced, and fungous granulations could be seen growing along the attachment of the extirpated middle turbinated body, showing involvement of the ethmoid labyrinth underneath it. Therefore as complete an intranasal extirpation as possible of the right ethmoidal cells was performed on January 31, 1908.

The first operations, done with cocain anesthesia, had been rendered hasty, because of the patient's unusual nervousness, which terminated in hysterical attacks. This time, therefore, chloroform was employed, the patient being kept in half narcosis in a half reclining position on a high operating chair, the operator standing at his work. The distinguished Danish rhinologist, Dr. N. Rh. Blegvad, of Copenhagen, who was visiting America upon this occasion, honored me with his assistance. The intranasal excision of the right lateral mass of the ethmoid bone was done in the following manner: A chisel-like instrument with a thin blade bent on the flat at an obtuse angle (Fig. 3), was pushed with the hand upward underneath the nasal bones and nasal spine of the frontal bone and backward under the cribriform plate (Fig. 2), in order to sever the anterior and upper surfaces of the lateral mass of ethmoid cells from their attachment to the cribriform plate and ethmoidal notch of the frontal bone as far outward as the os planum (lamina papyracea), the chisel following the direction of the upper and anterior attachments of the perpendicular ethmoidal plate. The mass of cells, thus cleanly detached in front and above, was then removed with the Grünwald-Hartmann punch forceps and Grünwald's set of nasal curettes. A diseased remnant of the middle turbinate was also found and cut away. The operation left a large hollow space extending outward from the septum to the os planum. No reaction followed, beyond slight pain in the right orbit when the eye was moved, and in the course of about two months the whole cavity left by the excision of the ethmoidal cells had healed over smoothly. No trace of tubercular disease had reappeared either on the septum or in the region of the extirpated ethmoidal cells at the last examination, January 18th, 1909.

Examination of sections of the removed ethmoidal lateral

mass showed the typical miliary tubercle shown in the drawing (Fig. 4) and some tubercle bacilli, thus making the diagnosis absolute.

The patient was nervous for some months after the operation, and had marked asthenopia, being unable to read or sew without exciting pain in the eyes, especially in the right eye. These symptoms have disappeared, and she is now in full health.

My second patient was typical of a grave variety of infiltrative nasal tuberculosis. She was a woman of fifty. No tuberculosis in the family and no luetic history. Her nasal affection began in June, 1908, the chief symptom being obstruction in both nostrils, which had gradually increased, until three weeks had gone by before she was first seen, on September 7th, 1908. In September she first noticed swelling of the external nose on either side of the bridge. There was no scabbing, and only a slight, watery discharge from the right nostril. No pulmonary involvement.

Examination showed a bulging swelling on either side of the nasal bridge, above the wings of the nose, as in the sketch. (Fig. 5.) This bulging was due to a great broadening of the foremost part of the cartilaginous septum where it blends with the triangular cartilages of the external nose, this broadening lifting the sides of the nose outward.

Rhinoscopy showed complete obstruction of both nares by the thickened septum, the thickening extending into the perpendicular plate above. The surface of the diseased septum on both sides was knobbed into irregular swellings and showed intact epithelium in some places, while in others it was covered with beds of pale pink, fungous granulations upon which ill-defined, superficial ulceration of a cheesy color could be seen. (Fig. 6.) The ulceration also extended across to both lower turbinated bodies, and the granulations had created adhesions between the left lower turbinate and septum. A contact ulcer also existed on the inner surface of the external nose on the left side, in the region of the limen nasi.

Sections from a piece excised from an ulcerated area on the right side of the septum were examined microscopically by Dr. Maximilian Herzog, who declared the tissue to be tubercular with a hypertrophic tendency and few infecting bacilli. The microscopic field showed epithelioid cells, lymphoid cells, polynuclear and giant cells.

Because of the extensive involvement of the triangular cartilages of the external nose from beneath, the tubercular infiltration of the thickness of the entire cartilaginous septum, and the widespread areas of tubercular granulations in the nasal fossae, it was obviously impossible to radically excise the diseased tissue, and therefore only the obstructing hypertrophic masses were cut away on both sides of the septum, in order to permit of free breathing. The nose remained open for two months, and during this period Dr. Herzog employed tuberculin injections, but without perceptible benefit. After this period the patient failed to return, so that there is no further history.

The complete recovery in the first of my two cases indicates the primary nature of her nasal tuberculosis and shows the value of surgical excision of the diseased tissue, provided it can all be removed. The possibility of a practically complete intranasal extirpation of the ethmoid cells on one side is also demonstrated. Had the disease had time to deeply invade the infundibular region and the frontonasal duct or frontoethmoidal cells (infundibular cells of Heymann) surrounding it, a later external operation through the processus frontalis of the superior maxillary bone might have been needed to clear this difficult region.

My second case is of interest as showing typically the deep-seated, formidable, infiltrative variety of nasal tuberculosis which permeates the cartilaginous skeleton of the nasal septum and of the external nose from beneath, and is similar to other cases of the kind described in the literature.

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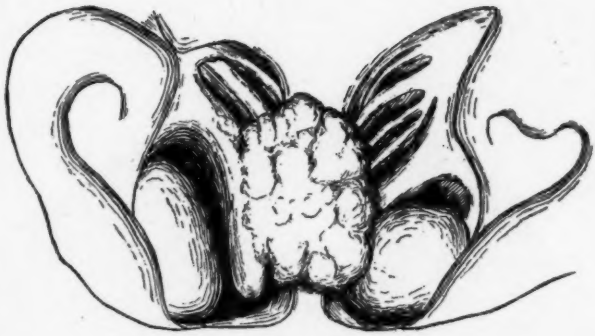

FIGURE 1.

Case 1. View by posterior rhinoscopy of tubercular granulation tumor projecting from posterior border of vomer and uniting the vomer to the middle turbinated body.

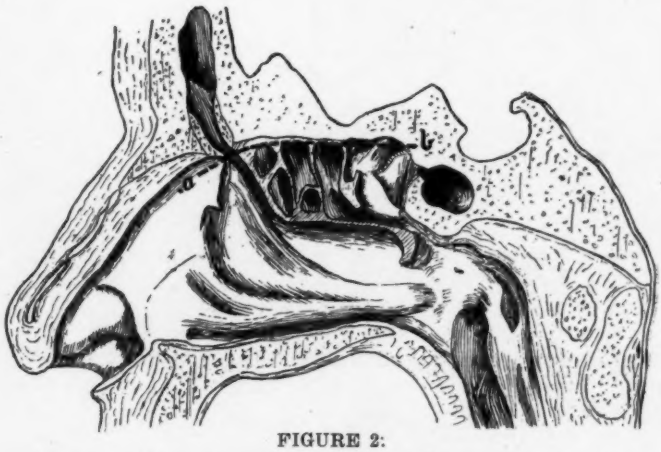

FIGURE 2:

Case 1. View of lateral wall of right nasal fossa. The middle turbinated body has been excised and the ethmoidal cells uncovered by removal of the inner vertical plate of the right lateral mass of the ethmoid bone. The dotted line a.....b indicates the path of the ethmoidal chisel in cutting through the attachment of the ethmoidal cells above.

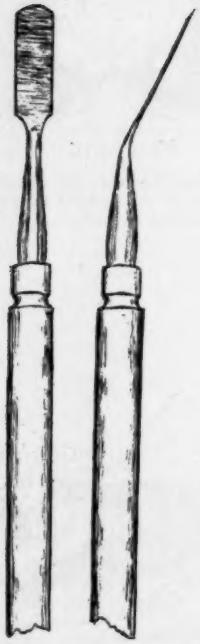

FIGURE 3.

Thin-bladed ethmoidal chisel, bent on the flat. Natural size.

FIGURE 4.

Case 1. Tubercle from ethmoid region showing caseation of center and giant cells.

FIGURE 5.

Case 2. Swelling of bridge of external nose due to tuberculosis of the cartilaginous septum and lateral cartilages of the external nose.

FIGURE 6.

Case 2. View into the right naris showing granulating tubercular ulceration of the cartilaginous septum and right lower turbinated body.

II.

EXTENSION AND FLEXION IN DIRECT LARYNGOSCOPY: A COMPARATIVE STUDY.*

By Richard H. Johnston, M. D.,

Baltimore.

The development of direct laryngoscopy has opened up a new era in the treatment of laryngeal disease. Lesions, especially in children, impossible to diagnose and to reach with the mirror, can now be handled with comparative ease. To Killian in Europe and to Jackson in this country we owe a debt of gratitude for placing the method on a rational basis. Improvements in instruments and technic have placed direct laryngoscopy within the reach of every laryngologist. When one becomes expert with the tube, he approaches all laryngeal lesions with greater confidence. It is only a question of time when it will replace the mirror for nearly all operative work in the larynx.

There are two methods of direct laryngoscopy: the one in which the head is held back in extension, and the other in which the opposite or flexed position is used. The former method has been used a long time; the latter, so far as I know, was first suggested by Dr. H. P. Mosher, of Boston, and has greatly simplified the examination of the larynx and the upper end of the esophagus in selected cases. We are all familiar with the extended position as practiced by Killian and Jackson, the latter of whom has given us an instrument which is very useful in both the sitting and prone extended positions. Before referring to the comparative merits of extension and flexion, it may not be out of place to describe briefly the method of extension which has proven most satisfactory to me.

A half hour before the examination, the patient is given a hypodermic injection of morphin (1/4 grain) and atropin

*Read before the American Academy of Ophthalmology and Oto-Laryngology, at the fourteenth annual meeting, held in New York City, Oct. 4, 5 and 6, 1909.

(1/150 grain), to relax the muscular system and to dry up secretion. He is seated upon a low stool and the pharynx and larynx are anesthetized, with a 20% cocain solution, by means of curved forceps. After waiting a few minutes the head is extended and supported by an assistant and Jackson's separable speculum, with or without the slide, according as the patient has or has not good teeth, is introduced until the epiglottis comes into view. It is now necessary to use more cocain in the larynx with the special cotton carriers. As one becomes more experienced little cocain is required for examining purposes. The epiglottis and base of the tongue are pulled forward and the posterior wall of the larynx comes into view. If at this point the head be brought forward to a position midway between complete extension and the normal erect posture, the best view of the larynx is obtained. During the past year I have operated in a number of larynges in the semiextended position, the cases including singer's nodes, tumors of the vocal cords, subglottic tumors and thickenings of the posterior wall. If the neck is short and thick and the teeth large, examination in the extended position may tax the patience of the operator to the utmost. In some such cases it is well-nigh impossible to see the anterior part of the larynx. Under general anesthesia, in the prone position, the same difficulties are encountered; in holding up the base of the tongue, the strain on the arm of the operator is so great that it cannot long be maintained. In my earlier work under general anesthesia, I was much discouraged with the direct laryngoscope in diagnosis and treatment; it was possible to see the posterior part of the larynx, but the anterior part of the organ always escaped me.

In April, 1908, Mosher published his "left, lateral route," which, briefly described, is as follows: The patient is etherized, the chin is slightly flexed on the chest, the left cheek is turned to the left until it almost touches the table; the operator sits comfortably at the left of the table and introduces the special spatula with the left hand. When the epiglottis comes into view, it and the base of the tongue are pulled upward by pressing the body of the instrument against the left, upper, bicuspid teeth. A good view of the larynx is obtained; if the anterior part is not seen, an assistant pushes the thyroid cartilage backward. Mosher claims that in 50% of cases the method is successful. It has been my privilege to operate successfully in

one case with his special spatula. The objections to his instrument are that it must be used with a head-light, which, in my opinion, is a disadvantage; it can be used only under general anesthesia; it is cumbersome.* For these reasons it is doubtful if it will meet with popular favor.

During the summer of 1908 it was my fortune to have under treatment a case of papillomata of the larynx in a child 4 years old. The diagnosis had formerly been made in the extended position, with the patient asleep; attempts to remove the growths *in extenso* proved very difficult. I tried in vain to use Mosher's instrument in the left lateral position; the spatula was so large I succeeded in causing trauma, but could not get a view of the larynx. A pillow was then placed under the patient's head to flex it on the chest, the mouth was opened and Jackson's child speculum with the drainage tube attachment introduced until the epiglottis came into view; this organ with the base of the tongue was easily pulled up, and a perfect view of the larynx obtained. The papillomata were quickly cleaned out with Pfau's cutting forceps. I at once decided to try this method without anesthesia at the first opportunity, realizing that if it could be done successfully the value of the method would be greatly increased.

My next patient happened to be a strong, healthy girl, 6 years old, with dyspnea. She was placed on the table, the head flexed on the chest, her legs, arms and head securely held by assistants, the speculum introduced and a clear view of the larynx obtained so that the diagnosis of stenosis was promptly made. Immediately after the examination the child jumped from the table and, barring a slight increase in dyspnea, was unhurt.

It can be imagined that, since the success of the straight, flexed method, I have discarded extension in children. Instead of Jackson's old speculum with the drainage attachment, I now use the modified child separable speculum. The modification consists in having the vertical part of the handle of the separable speculum cut off and a screw arranged in it so that it can be attached or detached at will. When the vertical handle is detached, the separable speculum makes an ideal instrument

*Since reading the above, Dr. Mosher has written me that he has had all his instruments made smaller, so that this objection no longer holds good.

for the straight, flexed method; with the handle screwed in, the speculum is ready for the extended position or bronchoscopy. I wish it distinctly understood that I claim nothing original for the above method. Mosher seems to have been the first to suggest flexion in direct laryngoscopy, and he deserves great credit for his discovery. The method described above will be found superior to Jackson's instrument in extension or Mosher's instrument in flexion.

The straight, flexed position can be successfully used in adults under general anesthesia; in my opinion nearly all such patients can be examined satisfactorily in the sitting, semi-extended position if the operator will have patience and perseverance. In only two cases have I failed to see the entire larynx at the second or third attempt in the sitting position; in one of these patients a thickening of the posterior wall was removed without the slide, while in the other patient a good view of the larynx was obtained, but the cutting forceps were not tolerated.

My chief purpose in asking your consideration of the two methods of direct laryngoscopy is to emphasize the superiority of the flexed method in children. We all know the difficulties which formerly attended the examination of the child's larynx with the mirror; we were fortunate indeed to catch fleeting glimpses of the pathologic condition. The advent of direct laryngoscopy was hailed with delight as giving us an easy and efficient method of examining the child's larynx. But the tube in extension did not fulfill expectations; the cramped position of the operator, the tense condition of the neck muscles and the difficulty of using the instrument proved great drawbacks. That the method was not entirely satisfactory is proven by the fact that such an expert as Mosher was seeking a simpler method. His left lateral route was a step forward, but the cumbersome instrument places it beyond the reach of most of us. The straight, flexed position, as I have chosen to designate it, will, in my opinion, prove the simplest and most satisfactory of all methods for the majority.

To illustrate the simplicity and usefulness of the straight, flexed method, I wish to cite briefly a few cases.

A girl, 6 years old, was brought to the Presbyterian Hospital with marked dyspnea, all the muscles of the neck and chest being involved in the respiratory act. She was placed on the

table, her legs, arms and head held by assistants, and examined in the flexed position without anesthesia. In a few seconds the larynx was exposed and the cause of the dyspnea seen to be a web of tissue between the vocal cords anteriorly; posteriorly there was a small opening through which the patient was getting some air. We realized at once that it would be possible to intubate with a small tube.

In December, 1908, I was asked to see a Bohemian child, 14 months old, at the Garrett Hospital. She had been intubated for diphtheria three months previously and had had increasing dyspnea for two months. The patient was placed on the table and examination made in the flexed position without anesthesia. The vocal cords moved normally; in the subglottic space anteriorly, a grayish mass was seen and posterior to this a small opening through which the patient breathed. The diagnosis of stenosis following intubation was made and the lesion located.

A girl, 2 years old, was brought to the Presbyterian Hospital with dyspnea. She was examined in the flexed position without anesthesia. In a few seconds the diagnosis of papillomata was made. Several physicians who were present saw the growths clearly through the tube.

A boy, 6 years old, had been hoarse for some time. Examination with the mirror failed. The patient was put on the table and examined in the flexed position without anesthesia. The diagnosis of singer's nodes was promptly made.

The severest arraignment of extension in children is probably that of Bokay, who, in his exhaustive treatise, *Die Lehre von der Intubation,* in the chapter on stenosis following intubation, says that Kirstein's autoscope is of no practical value in diagnosis; that Killian's speculum is not practicable on account of the difficulty in using it. He then pays his respects to the mirror method by quoting Hagenbach, who says: "If one has had a large experience in examining the larynges of children he will occasionally be able to make a positive diagnosis of the condition."

At a meeting of the Baltimore Laryngological Society last winter I described the straight, flexed position of direct laryngoscopy. The other laryngologists present did not understand how one could see around a corner through a straight tube. At different times the method was demonstrated to them, and

they all agreed that it has a useful place in the diagnosis and treatment of laryngeal conditions in children. To those who have tried the extended method in children and feel that it is not all that could be desired, I commend the straight, flexed position for its simplicity and usefulness. We cannot all be as expert in the use of the extended position as Jackson, or in the left lateral position as Mosher, so that something simpler is needed and will have a place in laryngology. If one will master the method described above, he will no longer fear any condition in the child's larynx. My confidence has increased greatly since the flexed position has given me such a safe and simple method of examination.

In conclusion, I would call attention to the following points:

Nearly all adults can be satisfactorily examined and treated in the sitting, semiextended position with cocain anesthesia.

The extended position under general anesthesia is difficult because of the cramped position of the arm and of the operator, and the trouble in seeing the anterior part of the larynx. The straight, flexed position without anesthesia is the simplest method for examining the child's larynx for the majority. For the few adults who will not or cannot be operated upon by other methods, the flexed position under general anesthesia will solve the problem.

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III.

HEMOPHILIA, WITH REMARKS ON THE HEMORRHAGIC DIATHESIS—CASE REPORTS.

By Thomas Hubbard, M. D.,

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Case I. Hemophiliac; Postoperative Bleeding.—M. G., a healthy, well nourished boy four years of age. During the previous winters had had several attacks of otitis, and was dull of hearing much of the time. In the fall of 1908 he had a severe cold and otitis media, and it was evident that he was drifting into a chronic catarrhal condition. Operation for removal of the large tonsils and adenoids was performed on the 31st of December, 1908. The tonsils were completely extirpated, by blunt dissection and snare, and adenoids removed by curette and forceps. The bleeding was profuse, but it apparently ceased and the child slept most of the following four or five hours. He then vomited an unusually large amount of dark clotted blood. It was a peculiar feature in this case throughout that it was very difficult to determine when he was bleeding.

It is peculiarly characteristic of this type of hemorrhage that the blood clotting is retarded and thus is formed the long ropelike clot hanging so far down into the esophagus that the fresh blood trickles down without any effort at swallowing. This child bled intermittently several hours before the condition was realized, and by that time he was quite exsanguinated. I located the seat of most active hemorrhage in the left tonsillar fossa, and applied digital compression. There was no evidence of bleeding for about 14 hours. Active persistent hemorrhage from the left tonsil was again detected, and I applied the tonsil compression forceps, using very firm pressure for 7 hours. During this period there was some bleeding from the nasopharynx and nose which I attributed in part to the congestion incident to the firm compression of

the larger veins, as evidenced by edema of the left side of the face. Normal saline solution 4 oz. every 2 hours, and lactate of calcium 90 grains daily were given per rectum, and fortunately well retained. The urine became cloudy with phosphates in a short time as evidence of absorption of lime. Gelatin was administered in every way possible, with the saline enemata and in milk and beef extract, to the extent of a pint or more daily. I should add that one of the important and difficult features of the management of such a case as this is in keeping the bowels free from decomposing blood clots and yet not draining the system by too free catharsis. So much depends on attention to these details, and it was only by the most competent nursing that this result was attained. On removal of compression hemostat and after resumption of liquid nourishment, in 48 hours the condition improved. Evidence of subacute otitis supervened, and either as result of this or extreme exsanguination he became very deaf. The temperature was elevated one or two degrees and the pulse was almost constantly above 130. Blaud mass, 1 gr., three times a day was begun on third day. On the fifth day there was nasopharyngeal hemorrhage, but on account of the otitis I did not think it best to make direct application of irritating styptics to the nasopharynx, and it ceased temporarily.

During the night of the fifth day there was violent bleeding from the right tonsil. As in the left there was no distinct point of hemorrhage but a general free oozing, and again I had to apply the compression forceps. There were the same symptoms of congestion and a more marked edema of the face, and free nasopharyngeal and nasal hemorrhage at intervals during the seven hours of compression. It was astonishing how well the child tolerated the forceps. He seemed to have greater dread of the hemorrhage and would even sleep with the clumsy instrument in place. In seven hours it was removed and there was no more bleeding from the right tonsillar fossa.

The child seemed to have about reached his limit of recuperation. He was at this time extremely pale, pulse feeble and rapid, 130 to 150, and the blood as it escaped looked like pink serum. On two occasions we actually prepared for transfusion by the method of Crile, as the case seemed so desperate and hopeless, but the hemorrhage became less copious,

and more easily controlled, and the operation was postponed. The tubal congestion gradually subsided and the hearing improved by the eighth day.

At this time the hemoglobin percentage was 28 (Dare) and it had probably been lower. From the eighth to the eleventh day there were frequent hemorrhages from the nasopharynx. By means of the Killian self-retaining palate retractor I could make direct compression for several minutes in the nasopharynx, using Monsel's solution. It controlled the hemorrhage for 6 to 12 hours each time, and by vigilance we were ab'e to prevent any considerable loss of blood. On the eleventh day the left tonsil again bled freely. This was ten days after removal of the hemostatic forceps, and it was indeed very discouraging. I controlled this by pressure and application of Monsel's solution. Every 6 or 12 hours blood would flow, the usual nervous excitement follow, and the higher pulse rate and tension increase the bleeding. Finally on the twelfth day I began the method of anticipating the hemorrhage. Every 6 hours firm pressure was made with swab saturated with Monsel's solution in the left tonsillar fossa and nasopharynx. Instead of causing dread and excitement this routine seemed to give the child confidence and quiet his fears. The last bleeding was on the fourteenth day after operation, but the treatment was continued at longer intervals for some days. Convalescence was slow but complete.

I should add that adrenalin was tried during the first hemorrhages but seemed of no benefit. During the last stages, when the nasal and nasopharyngeal bleeding was slight but persistent, I used pledgets saturated with 1:1000 solution in nares with good results as to nasal oozing. It seemed very useful in preventing slight hemorrhages but of little service in checking the flow when once established. (Drs. C. N. Smith and N. W. Brown were in frequent consultation and directed the general treatment.)

Comments.—The operation was perfectly done, and there was no traumatic laceration in the epipharynx or tonsillar fossae. Concealment of the hemorrhage was one of the trying features throughout. This was in part due to the character of the blood in this diathesis. Clinical observation of such a case tends to confirm the theory of retarded coagulation.

The clot was certainly of the ordinary consistency and the fibrin mass was firm and very tenaciously adherent to the oozing surface. One could see a firm clot almost decolorized near the fossa and hanging several inches into the esophagus, down which fresh blood was flowing.

Compression forceps were applied in all fourteen hours. It may have been longer than necessary, but the instrument was well tolerated and it was the proper procedure in this case.

One of the essentials in the use of any hemostatic appliance or coagulant is that the bleeding surface shall first be absolutely freed from fibrin clots. This was done by means of the curette forceps. I found the Monsel's solution very satisfactory. It does not form the firm, leathery, shrinking clot that is characteristic of the powdered persulphate or chloride of iron which conceals bleeding, and it is not so irritating but that it can be repeatedly applied.

Calcium lactate was given per rectum in thirty to ninety grains daily for more than two weeks, and gelatin to the amount of about a pint daily during the same period. The effect could not be definitely determined, but the end result justified their administration.

This case merits a brief consideration of surgical procedures other than those applied. It was evident that the bleeding was not from any particular vessel, and on my first inspection it was apparent that stitching the pillars together would not compress all of the bleeding surface. It came from the whole fossa. At this time I did not fully appreciate that the patient was a hemophiliac and it was very fortunate that ligation of the external carotid was not attempted. Radical surgical procedures should not be resorted to prior to determination of the true nature of the hemorrhage.

Heredity.—Parents healthy and the patient was the youngest by twelve years of the three children. A sister has exophthalmic goitre, and has undergone ligation of the arteries. The father had a severe expistaxis when about four or five years old, not traumatic, and it bled for several days until he was seriously prostrated. Maternal grandfather was called a "bleeder." He had a prolonged, severe hemorrhage from a tooth socket and while still a young man died of pulmonary hemorrhage supposed at the time to be caused by tuberculosis.

The patient had several suggestive but not severe hemorrhages from an injury to the frenum of the upper lip when an infant. Other than this the tendency to bleeding had not been observed. From the family record alone one is scarcely justified in calling him an hereditary hemophiliac, but the clinical history here narrated is quite typical, and temporarily, at least, he should be so classified, and it shows how very difficult it is for the surgeon to secure that information which would protect the patient and himself.

Case II. Scorbutus, Epistaxis.—M. C. This case illustrates the importance of the study of epistaxis as a symptom. It is not always a local lesion and the successful treatment must be general as well as local. The call was an urgent one, a case of epistaxis of three days' duration, several physicians having in vain attempted to check the hemorrhage. I found a young girl in a state of extreme exsanguination. During the examination syncope with complete loss of consciousness came on, no pulse perceptible, lasting about ten minutes. The blood-soaked condition of the bedding corroborated the statement of the parents that she had lost much blood, and, worse, she was still bleeding. Partial inversion and hot saline enemata aided in restoring to consciousness and permitted examination. There was a general oozing from the anterior third of the septum, and also from the turbinate, rather than a distinct arterial hemorrhage. I made the natural error of attempting to seal the vessels by the fused chromic acid method. She still bled. Adrenalin was inert. Only by packing firmly with gauze was it finally controlled.

The patient was carefully nourished and her appetite, ravenous after the fasting and drain of blood, was gratified in every way. But she still bled profusely at intervals during two weeks. I had labeled her an hemophiliac when I incidentally observed the condition of mouth and skin, and then I did what should have been done earlier; that is, study the case and search for the systemic cause. (General examination by Dr. N. W. Brown.) Patient a girl of ten years, undersized, anemic, skin dry and of dusky color, visceral examination negative. Gums swollen and spongy and frequent bleedings from the mouth for some months, and also hematuria. Tongue thick and dry and covered with small petechiae. The mucous membrane of the cheeks and pharynx

showed small hemorrhagic areas. Conjunctivae normal but eyelids puffy. Indurated swellings were noted in the left popliteal space over the thigh and also over the sternum, all showing more or less ecchymosis. Urine contained a trace of albumin and a few corpuscles. Blood: red blood corpuscles 3,412,000; Leucocytes, 9,800; Hemoglobin, 60 per cent. Coagulation period 6 to 7 min. The question of diagnosis involved hemophilia, purpura hemorrhagica and scorbutus. There had been no suggestive traumatic bleeding heretofore, nor hereditary evidences, and time of coagulation was not delayed. Purpura was excluded by absence of fever, the relative lymphocytosis and general character of the attacks.

The commonly observed etiologic factors that aid in diagnosis of scorbutus as seen in infancy are difficult to determine in a child of this age, but a careful inquiry gave evidence that she had never had proper food and lived in wretched hygienic conditions. The history brought out the fact that she had been in the scorbutic state of malnutrition for many years; rheumatoid pains in the limbs, hyperesthesia, muscular soreness, transient edema of the skin, with or without ecchymosis, sore bleeding gums and epistaxis being the symptoms observed. The crucial test in the diagnosis of scorbutus is the response to proper dietetic treatment, but in adults with long existing lesions and perverted physiologic habits the improvement would naturally come more slowly. In this instance it was noticeable that she gained steadily, and gradually all of the symptoms vanished. The relatives, alarmed by the desperate condition as described, came to the rescue and she was well fed and lived as never before. The diet consisted of fruit juices, fresh vegetables, beef and milk. Iodide of iron was prescribed and the treatment of the mucous membranes was of cleansing healing character rather than the usual styptic or escharotic remedies to stop hemorrhages. She was free from all evidences of the diseased condition in a few months, and remained well for eighteen months when last seen.

GENERAL REMARKS ON THE HEMORRHAGIC DIATHESIS.

The hemorrhagic diathesis can be divided into two classes, the pathologic and non-pathologic. To the former belong those diseases characterized by unaccountable hemorrhages

into the skin, mucous membranes, joints, organs, etc., with or without peculiar inflammatory conditions, such as scurvy, purpura hemorrhagica and allied diseases. The condition known as hemophilia alone represents the non-pathologic class. The modern teaching of pathology that such diseases as purpura and possibly scurvy are probably due to a microparasitic pathogenic agent still further emphasizes the necessity of such a distinguishing classification, and further, purpura and scurvy exhibit none of the hereditary characteristics of hemophilia.

All of these manifestations of the bleeding tendency have apparently certain features in common. The most prominent is the frequent involvement of the joints such as rheumatic arthritis and hemorrhages into the joints. This similarity is due in part to a somewhat loose application of the term hemophilia. Hemophilia is not a pathologic process, but a permanent condition (Litten). It is intensely hereditary. It is probable that many of the cases of socalled acquired hemophilia are manifestations of the hemorrhagic diathesis of pathologic character. In females it is shown by the tendency to transmit, and in males it becomes manifest. Women from bleeder stock, but not bleeders, are called "conductors." Late statistics show, however, that the proportion of females to males who manifest the disease is somewhat higher than was formerly accepted, it being 1 female to 13 males. Males may be "conductors" of the disease, but comparatively rarely. The theories advanced to explain hemophilia present so many contradictions that pathologists have, as a last resort, declared that it is not due to a pathologic condition in the ordinary acceptance of the term. It is quite generally accepted that the time of coagulation in lengthened. The test should be made of the blood drawn from a fresh prick rather than taken from a bleeding wound, on account of the fact that in the normal subject hemorrhage shortens the time of coagulation, and especially at the point of bleeding. Statistics show that the anatomic regions most frequently manifesting the "love of bleeding" are those of particular interest to our special art. More than fifty per cent are nasal hemorrhages, and the most fatalities also, about twelve per cent are of the mouth, and five per cent of the lungs. Nineteen cases of hemorrhages from extraction of teeth proved fatal in six instances, and to

still further clinch our interest it should be mentioned that the period of pathologic development of lymphadenoid tissue is the period when the tendency to bleeding is most liable to become manifest. The tendency to arthritic inflammation peculiar to hemophiliacs also calls attention to our anatomic preserve, the lymphadenoid ring, as the channel of infection.

For the protection of all concerned, surgeon and patient, a casual questioning will not always suffice to bring out the essential facts, as the absence of a "bleeder" in one generation engenders a false feeling of permanent security and the hereditary fault is forgotten. In the case reported in this connection I had made inquiry during the first three or four days of bleeding as to whether any of the family had shown this tendency, but it was not until the fifth day that the mother made the remark incidentally that her father was a "bleeder." Her immunity broke the continuity of heredity in her own mind. To facilitate a proper direction of inquiry before committing a surgical blunder the laws governing hereditary transmission are presented:

1. Daughters of a bleeder father are exempt, but may transmit to male offspring. (Crile.)

2. The sons of bleeder fathers are also as a rule exempt and do not transmit to their offspring.

3. The daughter of a bleeder father may transmit the disease to a single one, to several, or all of her offspring.

4. Where there are several daughters, the capability of transmission to offspring may be confined to one or all of the daughters may transmit it.

5. Occasionally there is direct transmission from father to son through several generations.

6. The disease does not appear in the issue of the sons of a bleeder family who are not themselves bleeders.

7. There is not always evidence of any hereditary influence so far as can be discovered by the record of ancestors.

The differential diagnosis between hemophilia, purpura hemorrhagica and scorbutus has an important bearing on treatment. Certain cases of hemophilia having no clear record of heredity may present symptoms, in so far as local hemorrhagic lesions are concerned, quite similar to purpura and scurvy, but a careful study of those general symptoms

which characterize a disease caused by a microparasitic agency or one associated with malnutrition will usually aid in clearing up the diagnosis. Prostration, fever and relative lymphocytosis are not characteristic of hemophilia. In scurvy, as seen in children, all of these systemic symptoms are found, but the diagnosis can usually be determined by inspection of the mouth. Swollen, bleeding gums and mucous membrane petechiae are characteristic. Purpuric spots on the skin, spontaneous or caused by slight traumatism, and above all, the evidences of malnutritional lack of development complete the clinical picture.

The true diagnostic test of scurvy is found in effect of treatment. Such patients respond quickly to a generous varied diet, including fresh meats, fruits, vegetables and orange and lemon juice.

Hemorrhage.—Two or three per cent of body weight can be lost without materially altering blood pressure, but the blood pressure is maintained at the expense of increased action of vascular nervous energy and that individual cannot withstand shock as well as one whose vascular nervous function has not been overtaxed. In a child weighing 30 pounds, from 6-10 to 9-10 of a pound, or nearly a pint of blood, can be lost without materially altering blood pressure (Crile).

Crile calls particular attention to one very important point in the pathology and treatment of hemorrhage. The vital nerve centers will not stand a prolonged or considerable degree of anemia without permanent damage. In these cases of prolonged hemorrhage, as obtains in the hemophiliac, this point must be kept distinctly in mind in watching for approach to the danger line.

In nose and throat operation concealed hemorrhage is often the cause of serious degree of exsanguination. How much of the blood swallowed is digested is an important question. It must be that a considerable part of it is restored to circulation, especially in prolonged bleedings. In the case reported this observation was made several times. A bleeding would occur as shown by bloody expectorations, and even during this bleeding he would take nourishment. An hour or so later the vomitus would contain dark, partially disintegrated clots, but no traces of the milk or gruel which had been recently swallowed. Blood clots in the stomach certainly did not stop digestion, and were partially digested.

Systemic and local treatment considered from standpoint of laryngologist, and with special reference to postoperative bleeding following tonsillectomy and adenectomy and nasal operations.

Calcium salts are probably the most commonly used drugs to increase blood coagulation. Calcium lactate has, to a considerable extent, superseded the chloride, as it is better tolerated. In children it should be given by rectum in half drachm doses two or three times a day and at longer intervals as the bleeding decreases. Iron or arsenic should be administered. These cases are usually long drawn out and every effort should be made to aid recuperation by maintaining nutrition. Exclusive milk diet, administered at short intervals, is considered to be of material benefit in increasing coagulability of the blood. Liquor thyroidei as well as adrenalin are possibly useful in checking obstinate hemorrhage in certain individuals, but there are no definite indications, and we may consider both to be still on therapeutic trial. One cannot afford to tamper with physiologic functions in critical cases and only clear indications should be followed. Stimulating drugs should be avoided in hemorrhage at any stage. The first indication is to maintain the volume of circulating medium and the physiologic solution of blood salts accomplishes this. The method of administration depends on the age and tolerance of patient and urgency of symptoms. If it be retained, enemata are the simplest and least disturbing. Small portions, 4 oz., given every 2 hours, is the best for children. If this fails, intracellular injections should be tried. Intravenous injections may be indicated, but only in emergency. In some cases it is advisable to maintain a steady sustaining supply of physiologic saline solution by means of continuous rectal injection.

If there is no response to the saline injections the serum method may be tried. Weil and others advise repeated small injections of fresh human or horse serum. Intravenously 10 to 20 c. c. or subcutaneously 20 to 30 c. c. should be given, and repeated in twenty-four hours if necessary. The difficulty is to obtain fresh serum, and this is essential, as the fibrin ferment, which aids in restoring coagulability to the blood of the recipient, is not permanent and disappears rapidly from the serum. Certain individuals are "sensitized" to

horse serum. This danger can be, in a measure, safeguarded by giving a small dose, 1 c. c., and if no central or vasomotor disturbance be noted in fifteen or twenty minutes, the larger dose can be administered.

If fresh serum is not available, diphtheria antitoxin serum may be given in the same manner as above outlined, but it would be less efficacious in promoting coagulation.

K. Wirth, in Vienna Letter, N. Y. Med. Rec., May, 1909, reports eight cases treated with horse serum. One was hemophilia, tonsillotomy, epistaxis. All of the eight cases had been treated by usual methods without benefit, and responded favorably to 20 c. c. subcutaneous injections of horse serum.

The method is not without danger, and the practice of making test injections of 1 c. c., as mentioned above, is advised.

Transfusion.—Carrel, Crile and others have demonstrated that direct transfusion of blood is a practical surgical procedure. It requires a refinement of surgical dexterity that is not given to every operator, but the chief difficulties have been overcome, and its field of usefulness outlined so that we may have a reasonable faith that in every hospital will soon be found the talent to apply it. It would seem that the true hemophiliac is an ideal subject for transfusion. Fortunately they are rare, but it would not be astonishing to find that there is a possibility of more or less permanently improving the blood in so far as coagulability is concerned, rescuing these doomed unfortunates from the dreaded fate that hangs over them. I have investigated one family of "bleeders" in which three sons of one generation died of traumatic hemorrhages. One of these I saw at the time when he suffered amputation of the arm after many futile attempts to check a bleeding of the hand which started from a slight cut. He recovered from this, but died soon after of another slight traumatic hemorrhage. Two sisters had sons who were bleeders. One lost two and the other one from hemorrhages; six deaths in two generations. This seems, as stated, an ideal field for application of transfusion. I shall only refer you to Crile's admirable book on Hemorrhage and Transfusion, convinced that the study of this subject and his work in perfecting this operation is of peculiar importance to throat and nose surgeons.

IV.

A STUDY OF SOME CASTS OF THE INFANTILE PHARYNX WITH SPECIAL REFERENCE TO THE EUSTACHIAN TUBES.

By William C. Braislin, M. D.,

Brooklyn.

The very considerable differences in relative size and shape between the pharyngeal cavity of infancy and of adult life form the basis for the following remarks:

Casts of metal or plaster are found useful in demonstrating the topography of this region. For purposes of photography those of the latter material, though more fragile, have superior advantages.

The photographs accompanying this paper were made from casts of fresh uninjected material as well as from specimens hardened in formalin solution. In order to demonstrate certain details, photographs of the tissues themselves have also been used.

The naso- or rhinopharynx is generally understood to include that portion of the respiratory tract posterior to the nares and above the level of the soft palate. It is so treated here. This tract is meant in all mention of the pharynx, nasopharynx or rhinopharynx in the present paper.

An examination of the pharynx of the new-born reveals a cavity with its long axis in the horizontal, rather than the vertical plane as in the adult. The long diameter of the infantile pharynx is anteroposterior rather than superoinferior. The cavity is relatively low and elongated, wide and flattened from above downward, approaching more nearly the shape of certain mammalia of a lower type than that of the human adult. The roof or vault of the infantile pharynx is nearly rectangular. On its surface is distributed the pad of lymphoid glandular tissue arranged in rather prominent folds. The folds diverge as from a center, the outer ones to the full width of the roof, and again converge toward the posterior edge of the nasal septum.

The pattern is fairly regular, though by no means constant. The rugae are distinctly visible in all the new-born specimens studied except in one very much emaciated child, where the vault was perfectly smooth and free from rugae. In fat infants they seem more than usually prominent. They have been noted well developed in the seven-months embryo and may often doubtless be visible, even on gross dissection, earlier. These folds usually retain their characteristic pattern when hypertrophied (adenoids), and are often thus removed. Masses taken away by the sharp curette, especially, frequently exhibit the characteristically shaped rugae, with deep creases between. At the center of the pharyngeal vault where the folds converge, in four of my specimens, a somewhat duct-like opening (the pharyngeal bursa) was seen.*

Behind the pad of glandular tissue which in the new-born extends but little posteriorly to the center of the roof of the pharynx, the mucous membrane is smoothly continuous with that lining the posterior and side walls. This portion of the mucous membrane after preservation in formalin solution, assumes fine transverse rugae in both infants and adults, being occasioned doubtless by the contraction of the fibers of the superior constrictor muscle. The anterior wall, composed of the posterior nares and septum differs from the adult in the following particulars: The posterior nares are wider and shallower, approaching in shape a pair of equilateral triangles placed on their bases, side by side, the septum like a widely spread V between them. (See Fig. 4.)

The infantile postseptal border arches very gradually from the horizontal plane at its superior attachment until near its inferior attachment, when it suddenly angles downward to the articulation with the horizontal plates of the palate bones.

The lateral walls in infancy show perhaps the widest differences from the adult of any of its boundaries, exhibiting the characteristics of this shallow and relatively long cavity. The most conspicuous landmarks are the prominences of the cartilaginous extremities of the Eustachian tubes which stand out sharply from the side walls, separating the depression of the

* Openings of this character may sometimes be observed in older children elsewhere in the pharynx. The writer has seen a case where several such openings were visible in a youth of seventeen years apparently as a result of inflammatory changes in unoperated adenoids.

pharyngeal mouth of the tube in front from that of the longer, more extensive and equally deep depression forming the fossa of Rosenmüller, behind. The prominences of the cartilage receive the direct impingement of the air current, inspired through the nares, and in some degree deflect it across the mouths of the tubes below, and against the roof of glandular tissue above. In the new-born the Eustachian cartilages are crowded closely to the roof of the nasopharynx. They narrow the cavity somewhat from side to side. Anteriorly to, and below, the cartilaginous prominences, at the depression of the mouths of the tubes and behind and above them (fossæ of Rosenmüller), the cavity of the infantile nasopharynx reaches its extreme width. The depressions created by the mouths of the tubes considerably widen its transverse diameter at this point, and this is likewise the part of the nasopharyngeal cavity of the least vertical diameter.

The mouths of the tube lie, relatively to the septum, more posteriorly in the infant than in the adult. Instead of being on a direct plane with the septal edge as in the adult, they are ⅛ inch posterior to it. This discrepancy is due to the lesser development of the vomer in the new-born.

Traces of the salpingopharyngeal and the salpingopalatine folds, one or both, may be noticed in the infantile pharynx. These follow the long axis of the cavity in both cases so that they extend more nearly horizontally in the new-born than, as in the adult, vertically.

The mouths of the Eustachian tube are relatively more nearly on a level with the floor of the nares than in the adult. They are bounded above by the prominences of the Eustachian cartilages while the lower lip merges into the floor of the cavity (soft palate). The muscles underlying the mucous membrane at this point, the levator and tensor palati, are both relatively well developed; both, however, taking more nearly horizontal than vertical directions than in the adult, from origins to attachments, due, in part, to the lack of development of the pterygoid processes of the sphenoid and to the inferior depth of the cavity of the nasopharynx in the infant.

The floor of the pharynx of the new-born compares closely with that of the adult. Its palatal portion is of greater diameter, anteroposteriorly. This is due to the vomer being relatively smaller and more anteriorly placed in the infant and the hard palate likewise relatively shorter, anteroposteriorly.

The differences in the form of infantile and adult nasopharynx depend directly and primarily on the bony framework of the surrounding structures, so that it is necessary to refer briefly to these, in order to elucidate the main causes of differences of the size and shape of the nasopharyngeal cavity of the new-born.

The sphenoid bone presents at birth little evidence of the subsequently marked development of the pterygoid processes of the adult. The vertical plates of the palate bones are likewise very short. The vomer, which in adult life extends its superior articulation to the posterior edge of the body of the sphenoid, articulates in the new-born with only the anterior half of the inferior surface of the sphenoid, in other words, it is relatively as well as actually smaller in the infant. The ethmoid, together with the bones of the face, have yet to undergo the development which increases so greatly the nasal mucous surface.

The superior maxillary bones including the hard palate (palate processes) are relatively small.

In the new-born the nares are apparently of inferior relative importance, while the pharynx from its greater length appears to be of relatively superior importance. It seems probable that in infancy a greater relative amount of the function of warming and moistening the respiratory stream is performed by the pharyngeal mucous and lymphoid tissues than by the nasal surfaces.

The dimensions of the infantile nasopharynx (from the average measurements of my series of casts of twelve specimens) are, width at fossæ of Rosenmüller and also at Eustachian tube mouths, 1.4 cm. (½ inch), depth, at plane of tubal orifies, .4 cm. (3-16 inch) to .8 cm. (¼ inch) or greater, posteriorly, as the floor, following the curve of the soft palate, descends. The horizontal portion of the vault is 1.5 cm. (⅝ inch) anteroposteriorly, and posteriorly, as it gradually curves downward into the posterior pharyngeal wall, the distance is as much greater. The horizontal portion of the floor of the nasopharynx (upper surface of soft palate) is relatively longer, as the hard palate (palate process of the superior maxillary) is relatively short, in the new-born than in the adult.

The anteroposterior attachment of the vomer to the body of the sphenoid in the adult extends nearly or quite, to the posterior edge of the body of sphenoid. In infants, it extends

across about half the body of the sphenoid, and the vaginal processes of the sphenoid do not enclose the vomer.

The shallow pharynx of the infant under five years, especially under three years, makes the use of any but specially adapted forceps for the removal of adenoids less applicable than in older children and adults. I believe that a curette is preferably employed, and as a result of experience, I think this should be broad, rather flat-bladed and quite sharp. If the blade is dull, little good will be accomplished, and partly detached portions of the growth may remain.

The writer wishes to acknowledge his indebtedness to Dr. Jonathan Wright, Dr. C. Schradieck, Dr. E. L. Oatman, and others, for generous assistance rendered in the preparation of this paper.

CONCLUSIONS.

1. The nasopharynx of the new-born is low, broad and relatively long. Its shallowness is due to the undeveloped state of the bones of the cranium, face and cervical vertebræ chiefly, the pterygoid processes of the sphenoid, the palate bones, the palate processes of the superior maxillary bones (hard palate) and of the vomer.

2. The inferior development of the nasal cavities may be responsible for a transference of greater relative respiratory importance upon the pharyngeal tissues. This may perhaps account, in part at least, for the lymphoid tissue of the infant being the seat of a relatively greater degree of hypertrophy than in the adult. As age advances, the growth of the bones of the cranium and face is very rapid, the vault of the nasopharynx becoming higher.

In adult life the vault is higher and apparently more withdrawn from the direct air current, although if the tissues remain normal, the functions of warming and moistening the inspired air are here still in part performed.

3. The difference in structure of the nasopharynx of the young infant indicates a somewhat different course of procedure in operations for the removal of adenoids. In infants of two or three years or younger, adenoid forceps are rarely applicable. It is believed that in children under five years, a Gottstein's curette or some modification of it, is preferable. A sharp, flat-bladed and fairly wide instrument best meets the indication in the hand of the writer.

FIGURE 1.

Nasopharynx of new-born, its long axis more nearly horizontal than in the adult. The postseptal border is also more nearly horizontal than that of the adult. (Slightly reduced.)

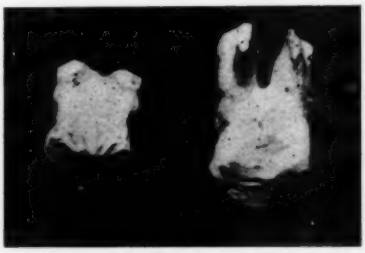

FIGURE 2.

Casts of new-born pharynges, superior aspects. In left cast the rugae are regular, in right (cast prolonged into posterior nares) the rugae are irregular.

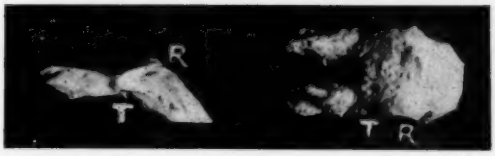

FIGURE 3.

Cast of new-born nasopharynx, lateral and superior surfaces. T are the projections into mouths of Eustachian tubes. R of Rosenmüller's fossae. Elongated projections at left ends of cast are the extensions into the posterior nares, and indentations at the extremities of these are made by the posterior ends of the lower and middle turbinated bodies.

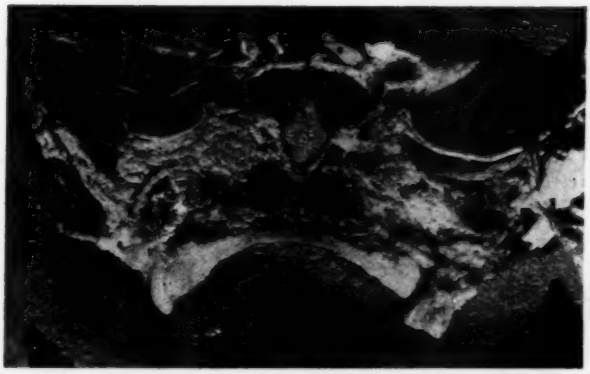

FIGURE 4.

Transverse vertical section just anterior to opening of posterior nares showing their triangular appearance.

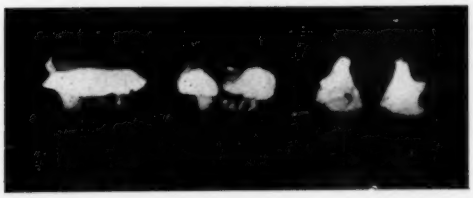

FIGURE 5.

Vertical cross-sections through three casts of nasopharynx of new-born (slightly enlarged). Figure on the left, at plane of mouths of Eustachian tubes; middle figure, at plane of posterior edge of septum; figure at right represents a cross-section within posterior nares.

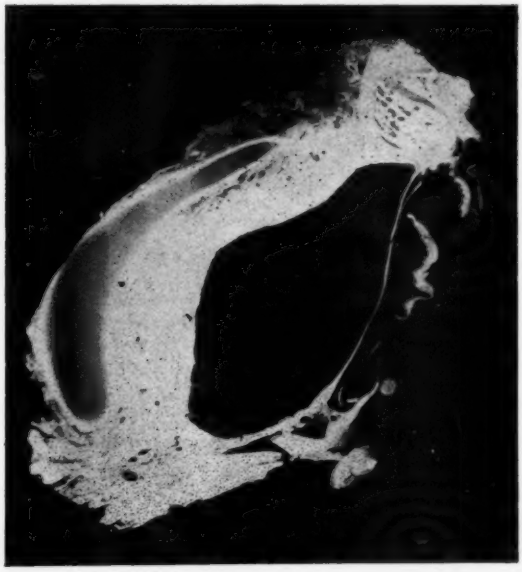

FIGURE 6.

Cross-section of the pharyngeal mouth of the Eustachian tube. The darker tissue (enlarged 7 diameters). Author's specimen. The line of the larger tissue at the left shows the Eustachian cartilage divided at its anterior, free, extremity.

FIGURE 7.

Cross-section of the tube, 2 cm. from pharyngeal mouth. Shows folds of mucous membrane within tube and relation to tensor muscles. Kindly photographed from the author's specimen by Dr. Edward L. Oatman. (Highly magnified.)

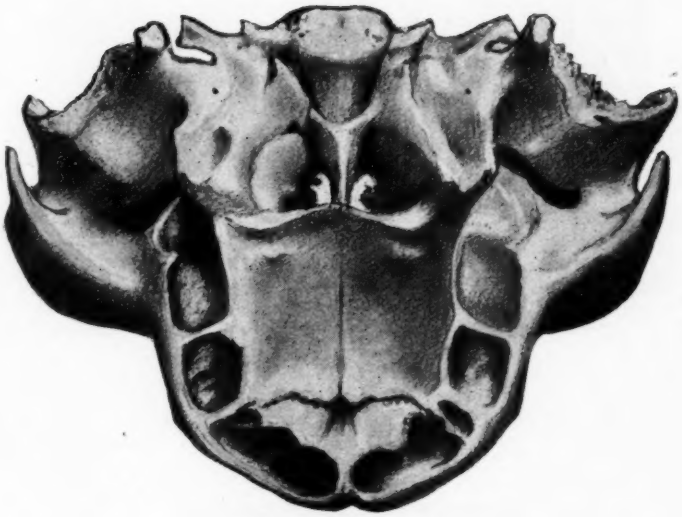

FIGURE 8.

Sphenoid, superior maxillary and palate bones of infant. Inferior development of pterygoid processes and of vomer as compared with same structures in the adult. Drawing made for writer from specimen loaned by Dr. H. Von W. Schulte. Almost twice nat. size.

FIGURE 1.

Nasopharynx of new-born, its long axis more nearly horizontal than in the adult. The postseptal border is also more nearly horizontal than that of the adult. (Slightly reduced.)

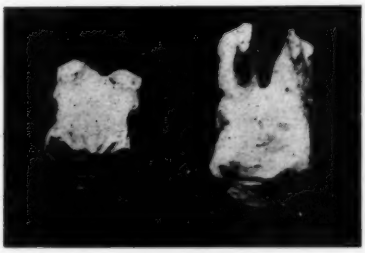

FIGURE 2.

Casts of new-born pharynges, superior aspects. In left cast the rugae are regular, in right (cast prolonged into posterior nares) the rugae are irregular.

V.

THE LARYNX OF MYCETES SENICULUS. (HOWLING MONKEY.)*

By J. Holinger, M. D.,

Chicago.

Several authors, among them Alexander von Humboldt, state that the voice of the howling monkey can be heard at a distance of more than a mile by actual measurement. Compare with this the fact that few steam whistles, pistol or even rifle shots may be heard at that distance, if especially favorable conditions like refraction and wind are excluded. One may then be pardoned for showing a specimen of the apparatus which can produce such powerful sounds, that a hunter standing under a tree where a family of howlers have their concert, feels pain in his ears. The nature of the howl varies from a low grunt to high pitched shrieks.

The teleogic cause of the howl is absolutely unknown. It is produced without any particular effort. The family of five to ten sit in a tree in a circle and father and mother and all the children howl while looking at each other, their solemn appearance accentuated by their long beards. This seems to me to exclude any sexual reason for the howling. The only explanation seems to be that they give their concerts for pleasure or perhaps to frighten away enemies. The first reason for howling is suggested by the fact that in captivity the animal never howls.

The construction of the larynx makes it impossible for the howlers to carry their head erect like other monkeys (see fig. 1), because the large larynx and hyoid interfere with an erect vertebral column. The mouth, the pharynx, and larynx differ from those of other monkeys, the trachea alone being like that of others. The hyoid bone undergoes the greatest transformation, its body forming the large bulla that you

*Demonstration before the Chicago Laryngological and Otological Society.

see between the two sides of the extremely high lower jaw (fig. 2 and 5). In close connection with this bony resonator is the thyroid cartilage which forms an oblong funnel with its margins rolled in. The cricoid cartilage and the trachea are but little different from other monkeys. In the large funnel shaped larynx there is a complicated apparatus which allows the animal either to breathe quietly through the rear passage and epiglottis or to direct the sound into the resonator. To see, however, all details we ought to have a fresh or alcohol specimen. The physical explanation for the production of those terribly strong sounds cannot be given.

According to Edmund Meyer (*Arch. f. Laryngol., XII*), air bags or diverticula of the trachea and larynx are frequently in monkeys of higher and lower types. They are, however, not constant in the same family, not even in the same species, but vary from individual to individual in location, size, and form. They are not in that direct connection with the voice as the above described apparatus, but subserve different purposes. I may therefore be allowed to ask whether it is right to range these air bags in the same category with the powerful instrument of the mycetes which must date back in its development to comparatively early embryonal life.

Finally I wish to thank Dr. McGibbons and Dr. Gary of the Field Museum for the demonstration and photographs of three or more dry specimens.

Figure 1. Full grown male. The head is carried low.

Figures 2 and 3. Front and side view of skull of the same. Note the high lower jaw and the bulla (hyoid bone) in place.

Figure 4. Hyoid and larynx in their relative position. For quiet breathing the air passes through the pharynx; for howling there is a separate opening leading to the resonator.

Figure 5. Same skull from behind and above, hyoid and larynx in place, skull cavity opened. To compare there is the skull of a chimpanzee of the same size. Note the different size of the brain cavity, the different form of the jaw (of interest is also a comparison of the ears, simple annulus tympanicus, no mastoid in the full grown Mycetes, well formed bony external meatus and a mastoid process in chimpanzee).

Figure 6. Specimen of Field Museum showing connection of the bulla with the thyroid cartilage.

VI.

ZOOLOGY OF MYCETES SENICULUS.

By Frank Collins Baker,

Chicago.

The Howlers belong to the American group of broad-nosed, prehensile-tailed monkeys, which are much lower in structure than the man-like apes (Anthropomorpha). They are placed as a distinct subfamily, Mycetinae, of the family Cebidae, on account of the vertical lower incisors and particularly the enormously inflated hyoid bones which form a bulla or resonator. The truncated occipital region and the great width of the angular portion of the rami of the mandible, together with the very large size of the vocal organs, are among the notable characteristics of these monkeys. These organs are said to be developed to a great extent in the male.

The Howlers are related to the Hapalidae or marmosets on the one hand and to the Ateles or spider monkeys on the other. In the family Cebidae the species are much smaller than the members of the old world monkeys belonging to the family Cercopithecidae. There are six species of mycetes, to which genus the Howlers belong, which live in tropical America, from Central America southward. They are most abundant in the dense forest regions of Brazil, where they live an arboreal life. Mr. Bates, in his "Naturalist on the Amazons," says that, "when Howlers are seen in the forest there are generally three or four of them mounted on the topmost branches of a tree. It does not appear that their harrowing roar is emitted from sudden alarm; at least it was not so in captive individuals. It is probable, however, that the noise serves to intimidate their enemies."

In Brehm's "Thierleben" the following interesting note appears:

"The other American monkeys, whose voice is piping like a sparrow's, have a plain, thin hyoid bone; but in this species the tongue rests on an extensive bony drum. Their upper

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In Brehm's "Thierleben" the following interesting note appears:

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larynx has six pockets which reflect the voice; two of these pockets are shaped like a pigeon's nest and resemble a bird's larynx. The plaintive sound peculiar to the Howlers is produced by the air forcibly streaming into the bony drum."

The Aluate or Red Howler (Mycetes seniculus), has a fur of auburn color, merging into golden yellow on the back; the hair is short and somewhat stiff. The average length of the male Red Howler is about four feet two inches, counting the tail as from twenty-five to thirty inches. The female is smaller and darker.

Schomburgk says: "For some time after my arrival I had, at sunset and sunrise, heard the fearful howling of the monkeys in the neighboring virgin forests, but had never succeeded in seeing them on my walks. One morning I set out after breakfast, provided with my gun, and a dismal howl just then resounding made me eager to kill some of these noisy disturbers. I hurried on through thick and thin, and after prolonged efforts succeeded in approaching a whole troop unperceived. They were right before me, in a high tree, and the concert they gave might have led people to believe that all the animals in the forest were engaged in deadly combat. Yet I cannot deny that there was some kind of harmony in the uproar, for sometimes the whole troop would pause, and then one of the singers would begin, and the dreadful howling would start afresh. The bony drum on the hyoid bone, which gives their voices such exceeding strength, could be seen moving up and down. For a few moments the sounds would resemble the grunting of a pig; the next instant they would simulate the roar of the jaguar rushing upon his prey, and then again came sounds like the deep and terrible snarl of the same animal, when, besieged from all sides, it recognizes its dangerous position. The dismal troop also had its ludicrous features, and the most confirmed misanthrope would have smiled if he had seen the grave and serious faces of the long-bearded vocalists."

VII.

A DISCUSSION OF THE VARIOUS INFLAMMATIONS OF THE ETHMOID BONE AS ADVANCED BY UFFENORDE IN HIS WORK, "DIE ERKRANKUNGEN DES SIEBBEINES."*

By Ross Hall Skillern, M. D.,

Philadelphia.

Prior to Uffenorde's work on the ethmoidal labyrinth which appeared in 1907, this structure was considered only in connection with the accessory sinuses of the nose and no particular importance was connected with it which the remaining sinuses did not share. Empyema and mucocele were the conditions recognized, but beyond certain ophthalmic complications, the indications were practically those of the neighboring sinuses. Uffenorde, however, did not view these cells in the same light as the true sinuses, but comparing the ethmoidal labyrinth to a sponge and the frontal, maxillary and sphenoid to true cavities, he argued that these structures on account of their morphologic differences could not be affected in the same manner, or at least would not present the same symptoms and conditions when affected.

The ethmoid, he contends, occupies a peculiar position among the accessory sinuses of the nose. It forms quite a considerable portion of the lateral sinus boundaries, presenting a complex and irregular structure. Why then shall this structure not react in the most vigorous manner against the many noxae which the inner nose encounters? Moreover, the structure of the mucous membrane here is exceedingly tender and loose, which also reacts in a special manner. If this mucous membrane in acute inflammation exhibits polypoid swellings, why shall true polypus not occur under the influence of continued irritation, presupposing that polypoid swelling is but a fore-

*Read before the American Academy of Ophthalmology and Oto-Laryngology, October, 1909.

runner of polyp formation, both being classed under inflammatory hyperplasia?

After investigations extending over a period of some years, he divided the diseases of the ethmoid into:

1. Acute inflammation.
2. Chronic inflammation.
   (a) Ethmoiditis hyperplastica cum polyposis.
   (b) Ethmoiditis suppurativa.

Of the chronic inflammations, the one by far the most common and least recognized, at the same time presenting the most varied and complex symptoms, was that of ethmoiditis hyperplastica. This disease is caused by repeated and prolonged irritation (frequent attacks of coryza, influenza, long exposure to dusty surroundings, etc.) and is always confined in the beginning to the body of the ethmoid capsule, being characterized by polypoid swelling of the mucous membrane in the basal cells, the extent of this swelling and number of cells affected depending upon the degree and length of time the irritation was directed against the parts. This inflammation (polypoid swelling) spreads through the various cells of the labyrinth without regarding the ostia, in other words, as the mucous membrane of these cells is so intimately connected with the periosteum and bone that it practically forms an anatomic unit, the inflammation goes over from one structure to another really by continuity so that this polypoid inflammation will appear in a cell entirely closed from its diseased neighbor as far as an ostium is concerned. The appearance of polypi or polypoid swelling in the nose proper will depend entirely upon the position of the middle turbinate. If this structure lies close against the lateral wall of the nose (normal position) the ordinary rhinoscopic examination will disclose nothing abnormal unless the disease has progressed for a long period of time, in which case the middle turbinate will show pathologic changes. As the basal cells of the capsule are always the first ones affected and are the first to show pathologic changes, unless these are brought into view the entire process will remain undisclosed. This can only be accomplished by the so-called rhinoscopia media of Killian in which the middle turbinate is fractured at its insertion with the ethmoidal capsule whereby the bulla ethmoidalis and base of capsule is brought into view. After this procedure by visual in-

spection and by the probe, one can always accurately determine whether this body is diseased; as the irritation invariably comes from the inspired air, it naturally attacks primarily the basal cells, therefore the floor of the ethmoid capsule is the first to show pathologic changes. It is impossible, however, to judge the extent of the disease by mere inspection, as the confined conditions of the middle nasal passage are not propitious for the growth and retention of large polypi, polypi being merely considered an aggravated form of polypoid swelling. It is important to recognize the normal mucous membrane of the ethmoid and differentiate it from the diseased. The normal mucous membrane covering the bulla, outer side of middle turbinate and processus uncinatus is extremely thin and of a greyish red color, quite different from that of the septal side of the middle turbinate, that of the processus uncinatus being sharp and well defined. One can easily differentiate it from the pathologic with the help of the probe, an instrument which cannot be dispensed with in these cases. If the floor of the ethmoid capsule shows a constant swelling, one can safely consider that some portion of the ethmoid labyrinth is diseased. Opening the most dependent portion of this capsule, thus to say making an autopsy in vivo, will confirm our diagnsis.

Uffenorde also believes that chronic inflammation of the ethmoid with the formation of polypi has per se nothing to do with empyema but that it (hyperplastic ethmoiditis) is purely a simple catarrhal inflammatory change which takes its origin from the same noxa or noxae that cause general catarrh of the respiratory mucous membrane of the nose. Individuals suffering with this condition exhibit a marked tendency to "catch cold," during which period the secretion changes from a thin serous watery consistency to one of purulency, only to return to its original consistency after the suppurative stage of the coryza has disappeared. These symptoms must not be confused with those which occur in acute exacerbations of chronic empyema. With latent empyema all secretion is frequently absent, a circumstance never occurring in chronic hyperplastic ethmoiditis. Such cases of hyperplasia of the ethmoidal mucous membrane are often falsely diagnosed rhinitis vasomotoria, hay fever, etc. In these cases symptoms of nerve irritation coupled with a watery secretion often predominate. The hyperplasia of the ethmoidal membranes are

frequently entirely hidden by the middle turbinate and remain absolutely latent, but on the other hand, polypoid hypertrophy and polyp formation may on inspection be quite pronounced.

ACUTE INFLAMMATION.

This is characterized by a more or less pale edematous swelling of the mucous membrane which can assume large proportions. This condition occurs chiefly on the middle turbinate, processus uncinatus and bulla, and may take on a polypoid character which in the course of a few days can subside and return to normal, so that the next examination presents a totally different picture. Subepithelial hemorrhages and engorged capillaries appear here as in the diseased mucous membrane of the other sinuses. Acute inflammation may also be purulent from its onset, especially in the acute infectious diseases (influenza, scarlet fever, diphtheria, etc.). In this case the rhinoscopic examination presents a different picture. In addition to the purulent discharge the mucous membrane is swollen and deeply congested. These cases occur quite frequently, but usually subside after the very acute stage has passed, for generally speaking the drainage conditions are better in the ethmoid than in either the frontal or maxillary sinuses. The possibility, however, of orbital and cerebral complications is by no means precluded.

Symptoms.—By far the most important symptom is the headache, which can assume every possible grade of intensity, but especially taking on a sense of heaviness, coming on in paroxysms. This occurs particularly over the parietal and occipital regions in conjunction with lancinating and burning pains above and below the orbit, but especially over the root of the nose. Ocular manifestations, such as epiphora, weakness of vision, especially on reading by artificial light, and scintillations occur. Ciliary and orbital neuralgia, and in severe cases dizziness and vertigo, may be present.

CHRONIC INFLAMMATION.

Speaking of this form of inflammation, one must bear in mind that many cases of chronic sinus disease run their course without any trace of polyp formation, and on the other hand many cases of profuse polyp formation have occurred without any symptom of empyema. There re-

mains then the combined process, polyp formation in the ethmoid with purulent secretion. We consider the purulent process in these cases as a secondary infection, therefore accessory. One of the best criterions as to the correctness of this opinion is the pathologic condition of the inferior turbinate. In this body, with suppurative ethmoiditis one always finds atrophy, while with ethmoiditis hyperplastica, hypertrophy of this body is the rule.

Referring briefly to the histopathology of the polyp and its relation to the underlying bone, Hajek demonstrated that the periosteum of the middle turbinate extended down into the medullary bone spaces, thereby meeting and joining the endosteum in many places, forming an anatomic unit. As the inflammation attacks the periosteal structure, it is easy to conceive how readily the endosteum can become infected without regard to the cell ostia. We must therefore accept the theory that the inflammation spreads by continuity rather than by the infection, resulting from the purulent secretion, when present, which may trickle over and bathe the parts. This is also proven by the fact that the maxillary sinus may act as a reservoir for the frontal for a long period of time without becoming affected. Mucous polypi grow only in the line of least resistance, therefore if the basal cells of the ethmoid are the first to experience the irritation and consequent inflammation, it depends entirely upon the position and relation of the middle turbinate to the lateral wall of the nose, how much of the diseased process we can observe by anterior rhinoscopy. In those cases in which the middle turbinate lies close against the lateral wall of the nose, even after it has been infracted, the appearance of the base of the ethmoid capsule will not give us a definite idea of the extent of the disease, because there was not sufficient space for polypi to become prominent, and if the disease has progressed for a long period of time, the hyperplastic inflammation will be found in the superimposed cells. These cases present unmistakable subjective symptoms such as profuse watery secretion, intracranial pressure, lancinating pains over the eyes, pharyngitis, laryngitis and asthma. The severity of these symptoms depend largely upon the neurotic condition of the individual as well as on the extent of the disease, as in certain instances only the most dependent cells are affected, while in other instances the mucous mem-

brane of the entire labyrinth and even the sphenoid sinus has become polypoid degenerated, the severity of the symptoms being about the same in both instances. Why is a purulent secretion and often a true sinus empyema present in these cases?

When we recall that the polypi springing from the inflamed mucous membrane can become so numerous as to occlude the middle and superior nasal passages, it is easy to conceive how the ventilation and cleansing of these passages through blowing the nose is prevented, with subsequent infection and putrefaction of the stagnant secretion. In uncomplicated cases these polypi are continually bathed in the serous secretion which is drawn out of the inflamed mucous membrane, partially through osmosis and partially through gravity, and adds to the irritation of the parts already occasioned by the presence of the polypi, thereby furthering the likelihood of infection. On recalling the accepted theories of the mechanism by which the sinuses become affected, a secondary infection of one or more of these cavities under these conditions is but to be expected.

Empyema of the maxillary sinus coupled with chronic hypertrophic ethmoiditis frequently occurs in which it is impossible to state which was the primary and which the secondary infection. We take it, however, that the ethmoidal affection was always the primary.

Typical primary empyema of the cells presents a totally different picture from the above. The pale, glazed polypi or polypoid hypertrophies are here absent, their place being taken by fibrous swelling or oftener atrophy of the mucous membrane, purulent discharge, fetor, etc. A characteristic picture of empyema is the presence of crusts in the nasal passages, a symptom which always fails in chronic hyperplastic rhinitis. These symptoms, together with redness and thickening of the processus uncinatus, will be sufficient to differentiate the two affections.

Symptoms.—The patient has the experience of a continuous cold which is not influenced by the ordinary treatment. He also complains of frequent attacks of sneezing, a continual sense of tickling in the region of the superior nares, headache, sharp pains above and below the orbital cavity, ciliary neuralgia and a more or less profuse secretion from the diseased side.

One of the principal symptoms is the headache which manifests itself as a drawing, sticking pain between the eyes, above and below the orbit, sometimes radiating toward the temples. In acute exacerbations of chronic ethmoid disease the headache is severer, of a more diffuse character and radiates toward the occiput and mastoid process, which is also typical for affections of the sphenoid sinus. Occasionally there is marked dizziness, the patient experiencing the feeling as though the eyes were being bulged outward.

On the other hand, the affection may run such a latent course that the patient consults us on account of other troubles, such as disturbances of the olfactory function, pharyngeal affections, tinnitus or deafness. All these not infrequently take their origin from this disease. The olfactory sense is usually affected, partially through hypertrophy of the middle turbinate (anosmia respiratoria) and partially through anatomic changes (anosmia essentialis). Subjective kakosmia is not infrequently connected with this condition. An unpleasant taste in the mouth is often present in the morning, due to the fermentation of the secretion which has collected in the choanae during the night. This secretion during the day on account of its profuseness is most annoying, as the patients can scarcely keep their handkerchiefs out of sight, using from five to twenty daily. This abundant flow of secretion leads externally to maceration of the epithelium around the external nares, with subsequent eczema, and internally to pharyngo-bronchitis and asthma.

Among the sequelae may be enumerated pharyngitis lateralis, hyperplasia of the pharyngeal and faucial tonsils, eustachian and middle ear catarrh. The orbital manifestations of chronic hyperplastic ethmoiditis are of especial interest not only on account of the obscure picture which they often present, but also on account of the frequency with which they appear. These are usually of mechanical origin, due either to the intracellular pressure from the hypertrophied mucous membrane or from stasis in the hematogenous or lymph channels or both.

These may be enumerated as follows:

1. Interference with the mobility of the bulb.
2. Irritation of the optic nerve through pressure.
3. Changing the refraction of the bulb.
4. Disturbance of physiologic lacrimation (epiphora).

The subjective symptoms consist of scotoma, neuralgic pains in the bulb, ciliary neuralgia and photophobia. In severe cases vasomotor disturbances, such as hyperemia of conjunctiva and edema of eyelids and periorbital tissues may occur. The appearance of these reflex neuroses is but to be expected when one recalls that the orbital and nasal cavities are supplied by the same sensory nerve.

CONCLUSIONS.

1. The ethmoid bone is subject to the following inflammations:

(a) Acute inflammation.

(b) Chronic hyperplastic inflammation cum polyposis.

(c) Chronic suppurative inflammation.

2. Hyperplastic ethmoiditis results from continued irritation of the mucous membrane without infection, when infection occurs an empyema results.

3. One can always judge whether the ethmoid is diseased after infraction of the middle turbinate. The irritation being coincident with the inspired air, always primarily attacks the basal cells, therefore the floor of the ethmoid capsule is the first structure to show pathologic changes.

4. Hyperplastic ethmoiditis presents a much stronger line of symptoms than suppurative.

5. Rhinorrhea is due to hyperplastic ethmoiditis. The middle turbinate is swollen against the ostia, the mucous membrane engorges upon itself and the secretion becomes squeezed and sucked out.

6. Typical suppurative ethmoiditis runs its course without polyp formation and simple hyperplastic inflammation without pus.

7. The presence of pus in hyperplastic ethmoditis is due to irritation and infection, fetid pus is due to saprophitic infection.

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VIII.

A NOTE ON EUSTACHIAN OBSTRUCTION.

By William C. Braislin, M. D.,

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The following note is the result of an effort on the part of the writer to differentiate obstruction or inflammation of the Eustachian tube from concurrent inflammation of the tympanic cavity. This naturally led to a careful inquiry from patients as to the presence of purely tubal symptoms in all kinds of ear diseases. Some of the conclusions reached, having proved of interest to the writer, are recorded.

Absolute occlusion of the tube is believed to be of extreme rarity. It is very much open to question whether those tubes which on Politzerization seem impermeable are entirely so. Bezold stated (1895) that he had not met with atresia of the tube in his autopsies.

In almost all cases of acute pharyngitis (and rhinitis) the mouths of the tubes are at least congested; they may be edematous, and active inflammation may extend along their lining membrane. In lymphoid tissue hypertrophies, the tubes are more or less obstructed.

It is a matter of common observation in examining the ears of patients suffering with an ordinary "head-cold" to find that there is more or less congestion of the ear, noticeable in a diminution of the luster of the membrana tympani. In these cases all subjective symptoms referable to the ears or tubes may be absent.

The Eustachian Tube as a Drainage Way.—The patency of the tube is usually sufficient to allow fluids, as blood, pus or serum, to drain from the middle ear into the nasopharynx. For example, the passage of blood into the throat and thence into the stomach is frequently noticed at operations on the mastoid, especially in the radical operation when the mucous membrane of the middle ear is freely curetted.

The Eustachian Tube as a Transmitter of Sound.—The tuning fork held in the open mouth is heard more distinctly in normal ears than when in front of the nostrils or the closed mouth, but not as distinctly as when held near the ear. Nor is the hearing of a fork held in the mouth increased when the external ears are held closed. A tuning fork held in front of the nostrils is not heard longer than when held at the back of the head.

The fact that a tuning fork held in the open mouth is heard longer and louder than when it is held in front of normally patent nostrils, does not indicate that sound waves travel through the tube more readily by this route, but that sonorous impressions are thus more directly transmitted to the bones of the head and their enclosed air spaces, and are thus by direct vibration transferred to the hearing organ.

A curious instance of voluntary deflation of the middle ear occurred in the case of a physician recently treated, who had normal hearing. In childhood he found that he was able to diminish the intensity of loud sounds which were disagreeable to him, by a voluntary act performed thus: The act of yawning was simulated, but without opening the mouth. Then an indrawing of the breath resulted in a rarefication of the intratympanic atmosphere, causing the drum membrane to be drawn against the inner wall of the cavity, with resulting diminution of all auditory perceptions. In order to restore the hearing to normal the act was varied by contraction of the tensor muscles as before and by then autoinflating the tubes.

Symptomatology.—In early inflammations of the tubes with beginning obstruction, also, after the subsidence of more pronounced obstructions, and in many chronic forms of ear diseases as well, the symptom of the occurrence of a snapping sound in the ears on swallowing or on blowing the nose, is present. The presence of this symptom always means a definite condition, and is a certain indication of partial tubal obstruction. It means that there is a partial obstruction of the tube, but one easily overcome. The mere contraction of the tensor and levator palati opens the tube sufficiently to restore wholly or partially to normal the atmosphere of the tympanic cavity. Though there may be some difference of opinion as to the exact cause of this snapping sound on swallowing, I believe it is chiefly due to the drawing apart of the walls of the

tube through a greater or less part of its length by the contraction of the tensor and levator palati muscles.

In severe phases of obstruction of the tube no snapping sound occurs on swallowing or on moderate blowing of the nose. Severe blowing, autoinflation, Politzerization or catheterization may, however, momentarily restore the atmospheric balance. In the most severe forms of obstruction, all these fail. Astringents applied to the pharyngeal mouths of the tube may aid in restoring the balance.

On investigating this phase of middle-ear disease, I have been surprised, though it may not surprise others, to find how common is the occurrence of the loud, snapping sound referred to, in one or both ears, in various forms of chronic middle-ear diseases, as in chronic catarrh and in the so-called mixed, middle and internal ear disease. I believe that inflammation of the tube alone may occur without involvement of the other parts of the ear as stated above; but, that more or less active inflammatory processes in the Eustachian tube co-exist with a large proportion of the non-suppurative ear diseases daily met with, may be inferred from the frequent presence of symptoms referable to the tubes themselves. The following symptoms are more or less significant:

Snapping.—A swelling of moderate or severe degree of the mucous membrane lining the tube impedes the passage of air into the tympanic cavity, where an apparently rapid absorption of air into the circulation is constantly occurring. Very mild degrees of obstruction are relieved by swallowing or pushing forward the lower jaw. When this occurs, a sound, similar to that of the separation of the moistened finger and thumb, held in front of the meatus, is perceived. This snapping sound made by the opening of the tube is heard more intensely when the swollen walls of the tube separate on blowing the nose or on autoinflation. In nearly all acute forms of ear diseases this symptom is more or less prominent, and it also commonly accompanies exacerbations of chronic middle-ear inflammation. It is an accompaniment of involvements of the tube in acute rhinitis and pharyngitis. Its presence in middle-ear catarrh and sclerosis is taken by the writer as a sign of a continuing degeneration of the middle-ear region, the cause of which should be sought for in the nose, pharynx or tonsils as well as in the tubes. It is a symptom frequently ignored by the pa-

tient, especially in chronic cases, and must nearly always be inquired for, in order to determine its presence or absence. It is never present in normal tubes nor in abnormally patent tubes. It is not a prominent symptom in very markedly obstructed tubes and cannot occur in absolute closure of the tubes. It appears to be common in pharyngitis, with or without involvement of more than the pharyngeal mouths of the Eustachian tubes. It is hence a frequent precursor as well as an accompanying symptom of various diseases, though it has been observed to occur at intervals for a long time without the accompaniment of noticeable impairment of hearing. On the appearance of the latter symptom, the occurrence of snapping sounds in cases of gradually progressive ear disease may cease or may become less frequent, or the patient may be so used to it that it is rarely complained of.

This symptom of tubal obstruction (snapping) may continue or recur at intervals in all forms of non-suppurative middle-ear diseases. Its irregular recurrence may indicate that these periods of obstruction of the tubes are partially or wholly responsible for the irregular course of the degenerative changes taking place in the ear.

Paracusis.—A symptom often complained of in Eustachian obstruction, though I believe not pathognomonic, is a sense of fullness in the ears, with more or less impairment of hearing (the latter may be absent) and a sound-sensation in speaking as if talking in a hollow space or into a barrel. Vertigo, usually slight, sometimes quite severe, may accompany this symptom. I am in the habit of associating these with a considerable degree of swelling of the tubal membrane. They disappear when due to tubal obstruction, on the disappearance of the acute symtpoms of the latter. Recurrence may take place with each attack of acute inflammation in nose, pharynx and tubes.

Pain.—Pain due to tubal inflammation is rarely present without inflammation of the tympanic cavity, and I think can rarely be demonstrated as referable to the tube alone.

Pain in the Eustachian tube, however, is rarely located by patients. The discomfort of passing the Eustachian bougie is usually referred by the patient either to the ear or to the side of the throat. The objective symptoms may be slight or absent; though, if the obstruction is pronounced the retraction of the membrana tympani is very noticeable.

Itching.—Two cases in which a sensation of itching seems clearly referable to tubal congestion are briefly reported.

1. Philip Kelly, twenty-five years old, has had impairment of hearing and tinnitus for three months following a "cold." At first he had a great deal of snapping in his ears on swallowing or blowing the nose. Watch, Right 1-60; left 1-120. An itching sensation felt in the throat. He has tried to relieve this by scraping it as far inside the back of the throat as he could reach with his finger nail. Extreme retraction of the drum membrane, slight congestion of vessels of drum.

2. Henry Mollow, twenty years of age, has had severe tinnitus for one week in both ears, following a salt-water bath. On the fourth day he had slight pain in the ear, but no disturbance of sleep. Previously there was snapping in the ears. At present he has a sensation of fullness in the ears. Tinnitus is noticeable in both ears and an itching apparently deep in the ears. The drum shows retraction and slight congestion of hammer vessels.

A sensation described as itching or "crawling" in the ears or tube is sometimes a symptom of tubal obstruction. Thus, a lady of forty years (Everdell, July 31, '05), who complained that she had at times a sensation in the ears as though there was something crawling in her ear, obtained relief for a time after each autoinflation.

The tympanic cavity, however, does not long maintain its integrity after the occurrence of pronounced obstruction of the tube, and a reddening of the membrana tympani soon occurs.

Tinnitus.—Diseases of the nasopharynx and Eustachian tube are so admittedly cases of tinnitus that one accepts it axiomatically. That tinnitus is, frequently, directly referable to tubal congestion or inflammation, I think certain. It is a matter of observation that the inhaling of cigarette smoke may cause an immediate increase of tinnitus. An *initial* inhalation may cause this. As this may occur with the first inhalation and without swallowing or any act which would draw open the tube, it seems clear enough that the irritating effect of the smoke on the pharyngeal mouth of the tube is responsible for this. If irritation at the mouth of the tube may cause or increase tinnitus, it is proper to infer that irritation, congestion or inflammaion of the deeper part of the tube may cause tinnitus. This is not a mooted point, but I have frequently found

it difficult to refer tinnitus definitely to this region rather than in another part of the ear.

The symptom of a snapping sound heard by persons with moderate degree of obstruction of the tube on swallowing, blowing the nose, protruding the lower jaw and certain other methods of contracting the tensor and levator palati muscles, is of importance in indicating a continuing of the tubal trouble even after the existence of middle and internal ear disease of many years' standing. How much influence these continued or recurring obstructions of the tubes bear upon the progress of the trouble I am not prepared to say, but I believe it worth while to ascertain the presence or absence of this symptom, not only because its presence indicates the need of treatment of the tube, but also in that it indicates a moderate degree of obstruction, rather tending to a favorable prognosis, other conditions being equal.

When snapping sounds are absent, I believe it indicates that there is no obstruction, as in some sclerotic or atrophic changes, or that the tube is so much obstructed that air is conducted to the tympanic cavity only with great difficulty. Further examination and tests easily reveal which of the two conditions is present.

The following table shows the considerable proportion of non-suppurative ear diseases in which the above symptom was found in a series of cases from a clinic in January:

Sex.	Age.	Disease and its duration.	Absence or presence of snapping sounds.	Remarks.
Male	69	o. m. c. c. 10 yrs.	Affirmative	Noticed at intervals only; more noticeable before treatment was begun.
Male	27	o. m. c. c. 5 yrs.	?	Mucus evacuated from tube on catheterizing.
Female	25	o. m. p. resid. 4 to 6 yrs.	Negative	Chronic pharyngitis present.
Female	65	o. m. c. c. 20 yrs.	Affirmative	Noticed on coughing as well on blowing the nose.

Sex.	Age.	Disease and its duration.	Absence or presence of snapping sounds.	Remarks.
Female	—	o. m. c. c. 5 yrs.	Affirmative	Snapping also occurs without effort on part of patient.
Male	26	o. m. c. c.	Negative	
Female	50	o. m. c. c.	Negative	
Female	40	o. m. p. resid.	Affirmative	Vertigo at times.
Female	29	o. m. c. c.	Negative	
Female	19	o. m. c. c.	Negative	Snapping occurred previously i. e. before treatment was instituted.
Male	49	ot. med. et int.	Negative	
Female	6	Day after recovery from o. m. p. a.	Negative	No sound noted on Politzerization.
Male	59	ot. med. et int.	Affirmative	
Female	39	Recovered from mastoid op.	Affirmative	
Male	40	Tubal catarrh	Affirmative	States snapping is almost continuous. Is a cigarmaker.
Female	20	o. m. scl. 5 yrs.	Affirmative	At times not noticeable.
Male	43	o. m. c. c.	Affirmative	
Male	52	ot. med. et int.	?	Formerly much snapping. At present none; but hearing is worse than when snapping occurred.

The evidence of the presence of tubal obstruction in chronic middle-ear diseases indicates a need for the treatment of this important complication. It may be possible to do little or nothing for the middle-ear diseases other than that affecting the tube alone, which as a rule is tractable. Treatment directed to the relief of tubal obstruction alone, has a postive effect in preventing or checking the progress of diseases affecting other portions of the sound conducting apparatus.

IX.

PARTIAL BIBLIOGRAPHY OF RECENT PAPERS RELATING TO THE EUSTACHIAN TUBE.

By William C. Braislin, M. D.,
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In the preparation of this list the reports on the progress of otology in the *Archives of Otology* have been freely utilized. This has enabled the writer to include several important papers in the list, the originals of which would not have been readily accessible, though in nearly all instances the references have been verified by direct examination of the papers themselves. In most cases of articles not written in English the titles are given in translation.

Allen, Harrison, On a New Method of Recording the Motions of the Soft Palate. Trans. of the Coll. of Physicians of Philadelphia, 3rd Series, Vol. VII, 1884, pp. 164-194. Allen observes that motions of the soft palate are transmitted to a rod passed along the floor of the nose into the pharynx, and, by means of a mechanism, these motions are recorded on a revolving cylinder in much the same way that the heart impulses are similarly recorded. It furnishes a positive basis of record of the motions of the soft palate. Tracings of various consonant and vowel sounds are figured and the method. Allen suggests its usefulness in paralysis of the palate, also possibly in stammering and in determining the degree of degeneration of the levator palati muscles in progressive dry catarrh.

Bacon, Gorham, The Anatomy, Physiology and Diseases of the Eustachian Tube. Reference Hand-book of the Medical Sciences, Vol. II, N. Y., 1886.

Ballenger, Wm. L., Tenotomy of the Tensor Tympani Muscle for the Relief of Deafness and Tinnitus. Laryngoscope VIII, 1900, pp. 85-89. The causes, indications for operative interference and contraindications for same are described.

BARATOUX, J., De l'electrolyse ou de la galvanocaustique chimique de la trompe d' Eustache. Revue Mens. de Laryng., 1884, No. 6, pp. 185-194 (On electrolysis or chemical galvanic cautery treatment of the Eustachian tube). Baratoux refers to previous attempts at the employment of electrolysis for obstructions of the tubes. He used a hard rubber catheter, at its enlarged end a hole, through which an electrode of silver or platinum is introduced. The second electrode is placed on the mastoid process. The current is used not stronger than five milliamperemeters nor longer than five minutes.

BERNOUD, The Treatment of Deafness with Insufflations of Hot Air. Wiener med. Blätter, XXVI, No. 39, 1904, pp. 475-477. The apparatus of Beck is used. The temperature of the air is regulated by an electrical heater. Bernoud states that tinnitus disappears and a slight improvement in the hearing occurs from its use.

BEZOLD, FRIEDRICH, A Case of Perforating Wound of the Organs of Hearing, in Court, and Subsequent Indictment of the Plaintiff for Supposed Simulation and Perjury. Berliner klin. Wochenschrift, XX, No. 40, 1883, pp. 611-614. An individual received a shot wound of the left ear and brought suit against his assailant. This case was finally referred to Bezold for an expert opinion. He found that the injury (a knife cut inflicted by the defendant with a sharp-pointed knife in the neck) had penetrated the lumen of the tube, causing a complete obstruction. A whalebone bougie met the obstruction 14 mm. within the mouth of the tube.

BEZOLD, F., Cholesteatoma, Perforation of Shrapnell's Membrane, and Occlusion of the Tube. An Etiological Study. Translation by Dr. J. A. Spalding, Archives of Otology, XIX, 1890, pp. 232-254. A case was observed, postmortem, of entire occlusion of the tympanic orifice, demonstrated, viz., a marginal adhesion of the entire periphery of a perforation of Mt. existed. When the tube was inflated the rest of the Mt. puffed out all about the tubal orifice.

BLAKE, CLARENCE J., reviewing article by C. Nicoladoni, Beobachtung am Lebenden über die Bewegung der Tuba Eustachii, Arch. Ophthalmology and Otology, Vol. V,

1876, p. 122, states that he saw a case in which the normal Mt. was lacking and a thin cicatrix extended over the auditory canal. At the commencement of the act of swallowing, this cicatrix was forcibly extended, falling into place at the end of the act.

BLAU, L., Ein fall von kronischen Krampf des Musculus Tensor tympani ohne subjective Empfindung. Archiv. für Ohrenheilkunde, Bd. XIII, p. 261. A 14-year-old boy had sensation of pressure and temporary lancinating pains in his right ear, increased resonance of his own voice, many subjective auditory perceptions, normal hearing. Spasmodic rapid motions of the Mt. were observable; also changes in the cone of light or extreme retractions of the Mt. not connected with respiration. Author attributes these to contractions of tensor tympani muscle.

BONNIER, M. P., The Tubo-tympanic Functions. Note, presented by Girard. Compt. rend, des Séances de la Soc. de Biol., Nov. 26, 1892, Feb. 18, 1893, April 15, 1893. "Descriptions of the manner in which the Eustachian tube, the tympanum, otoliths and otocysts assist in the functions of the apparatus of equilibrium."

BOULAI, Voluntary Contraction of the Muscles of the Tympanic Membrane. Arch. internat. de Laryngol, etc., XIII, 2, 1893. Two cases observed where a distinctly audible crackling noise occurred 30 times a minute. In one, the drum showed simultaneous vibrations. It could be produced voluntarily. Boulai considered it due to contractions of the tensor tympani.

BRAISLIN, WM. C., Eustachian Catarrh with Hyperinflation. Report of a case. Archives of Otology, XXXVII, 1908, pp. 215-216. Report of a case of extreme patency of the Eustachian tube, with an account of symptoms.

BRANDEGEE, WM. P., Tympanic Vertigo due to Obstruction within the Eustachian Tube. Arch. of Otology, XXX, 1901, pp. 205-213. The value of the electrolytic bougie is contended for. Over other forms of bougies Brandegee claims the advantages of ease of manipulation, a minimum of pain, a minimum amount of trauma, thorough destruction of the stricture or occlusion and that the force to be used should be only that sufficient to insure good contact for the current.

BROICH, F., Method of Direct Vibratory Massage of the Eustachian Tube and Its Effect on the Middle Ear. Report Germ. Otol. Soc. Arch. of Otol., XXVIII, 1899, pp. 388-389. Special probes introduced by way of the nose afford a direct massage of the pharyngeal ostium and the commencement of the tubal canal, as produced by Spoes' saw-handle driven by the electro-magnet.

BRUNNER, GUSTAV, On Alterations in the Hearing by One's Own Voice. Arch. Ophthal. and Otol., II. No. 1, 1870, pp. 107-126. Case of deafness (obstr. of tube) in which patient's own voice seems too loud in affected ear and very disagreeable. Inflation of air through the tube caused cessation of symptoms. Regarded symptoms as not due to exudation of fluid in middle ear.

BRUNNER, G., On Vertigo Occurring in Affections of the Ear (Auditory Vertigo). Archives of Ophthalmology and Otology, II. No. 1, 1870, pp. 293-341. Vertigo may be occasioned by external pressure upon the drum-heads, by impulsions of air or liquids into the tympanic cavity through the Eustachian tubes or by the passage of a galvanic current through the ears. In injecting sulphate of zinc, one and one-half grains to the ounce, in right ear, his patient felt as if drawn to the direction of same side (right). [He says erroneously that the patient had a tendency to fall towards the right side. The patient makes an effort to overcome the apparent (to the patient) falling to the right and falls to the left side in such a case.]

BRYANT, W. SOHIER, Demonstration of the Movements of the Eustachian Tube. Archives of Otology, XXXV, 1906, p. 564. (No details reported.)

BRYANT, W. SOHIER, The Anatomy of the Child's Ear, Emphasizing Points of Practical Importance. Arch. of Otol., XXXIV, 1905, pp. 80-83. Bony portion of Eustachian tube absent at birth. Cribriform bone interposed between the floor of the tympanum and the carotid canal at the jugular fossa, which is below the tympanum, not behind. The mastoid is but slightly developed. The Eustachian tube is narrower and much shorter in the infant. It measures about 20 m. as against about 40 m. in the adult from the anterior border of the sulcus tympanicus. Its

lumen at the isthmus is 2 m. as against 4 m. in the adult. It lies in a horizontal plane. Its angle with the median plane is about 45° and outwards as in the adult. At puberty it assumes the adult position. The relative position of the pharyngeal mouth of the Eust. tube to the posterior pharyngeal wall and the velum palati is farther forward and slightly lower down. The fossa of Rosenmüller does not form a deep impression till later in life. At birth the cavity of the middle ear, being filled with myxomatous tissue and detritus, no air enters the tube immediately [but it is probable that the motion of the tensors produced by sucking, rapidly stimulates the opening of the tube].

BRYANT, W. SOHIER, The Eustachian Tube, Its Anatomy and Its Movements; With a Description of the Cartilages, Muscles, Fasciae, and the Fossa of Rosenmüller. Medical Record, LXXI., pp. 931-934, 1907. A detailed anatomical study of this region.

BUCK, A. H., Unnatural Patency of the Eustachian Tube. Am. Jour. of Otology, II., 1880, pp. 203-205. A case related.

BUERKNER, Report on the Treatment of Affections of the Tube. Report German Otol. Soc., 3rd meeting. Arch. of Otology, XXIV., 1895, pp. 59-62. Attention is called to the importance of catheterization when there is swelling in and mucous secretion of the tube, preferring it to Politzerization. The fear of causing infection of the middle ear in acute nasopharyngeal or tubal affections is an exaggerated one, the neglect to inflate the middle ear causing the most harm. Gargling is regarded as an important measure in all simple tubal affections. Injections through the catheter are useful but should not be irritating. The use of the bougie in the tube is only indicated when catheterization causes no improvement. Medications and the use of the bougie are seldom productive of good results, though the vibration massage, by means of the bougie, by Urbantschitsch's method, is sometimes indicated. This is often painful. Politzer's method of external massage, on the other hand, is not. In atresia of the tube electrolysis and excision of the drum membrane and malleus are measures for consideration. Abnormal

patulousness of the tube and abnormal conditions of the nose and nasopharynx (ulcerative processes, synechiae, adenoid vegetations and hypertrophy of the tube) are important in their bearing. Galvanocautery is not devoid of danger; acids are preferable. Discussion: Bezold agrees that the air douche should be used in acute affections of the tube. Catheterization is often preferable to Politzerization even in children. He has never found atresia of the tube in all his autopsies. The use of the bougie should be restricted. Bresgen recommends removal of nasal obstructions. Siebenmann does not consider nasal obstruction to have any etiologic significance in tubal disease. Apart from adenoids he has not found stenosis at autopsies. Barth and Fischenick believe nasal obstruction an etiological factor. Hartmann uses inflation as long as good results are obtained. He frequently uses injections. Cocain acts well. Removal of nasal tumor may often be dispensed with if thin, short-beaked catheters are used.

CALHOUN, A. W., Adenoid Vegetations, with Especial Reference to Their Influence Upon the Ear. Laryngoscope VI., 1899, pp. 164-168. "Direct pressure upon the mouth of the tube rarely occurs, and yet its function is so frequently interfered with that contraction or sinking of the drum-head follows. Perhaps the aural symptoms are due to the swelling of the mouth of the tube or an extension of the inflammatory process through the tube into the middle ear. Breathing through the mouth and the blocking of the postnasal space change the air currents and alter the pressure about the mouth of the tube." The growth hinders the free action of the muscles controlling the lumen of the tube and permitting the entrance of air into the middle ear. This condition causes defects of hearing. This process sooner or later ends in chronic catarrhal otitis media with ankylosis of the ossicles. A suppurative inflammation frequently results from the presence of the mass.

CAMERER, Foreign Body in the Eustachian Tube. Archiv. für Ohrenheilk., XL, 1896, pp. 63-64; Tubingen, 1894, Abs. A six-year-old boy fell from a wagon fifteen months previously. A piece of straw was driven into the mouth

at the time but the visible portion was removed. One month later the right lateral pharyngeal region presented a swollen condition and otorrhea appeared in right ear. The latter continued a year with latterly aural hemorrhage. On the removal of offensive pus and granulations, roughened bone was detected and a movable body, which when removed proved to be a straw, 4 1-2 cm. by 2 mm.

CITELLI, S., On the Structure of the Human Eustachian Tube. Archivio Italiano di otologia, XVI., 1905, pp. 404-418, pp. 441-452. The histology of the tube is given in detail.

COLLET, On Salpingoscopy. Lyon Médical, 46, 1903, pp. 725-730. The Valentin salpingoscope is recommended.

DENCH, E. B., New Eustachian Bougie. Archives of Otology, XXI., 1892, pp. 149-156. A fine whalebone bougie is used. This is attached to the catheter by guides so that the lumen of the tube is not obstructed; at the same time the bougie may be passed into the tube at the same introduction as the catheter.

DENKER, The Eustachian Tube of the Ant-Eater. Zeitschr. für Morphologie u. Antropologie, Bd. VIII., pp. 1-10. A paper regarding the comparative anatomy of Myrmecophaga jubata and M. didactyla.

DENKER, Investigations of the Eustachian Tube of the Ant-Eater. Myrmecophaga didactyla et M. jubata. Trans. Ger. Otol. Soc., 1904. In the first, no true tube exists, for a broad cavity surrounded by membranous walls occupies the place of the tube. No bony tube. There is a round opening from the posterior and inferior corner of the tympanum to which the membranous canal is attached. In the latter species the large cavity is surrounded anteriorly by the tympanum and the pterygoid, posteriorly by a process of the basilar occipital.

DENNERT, H., Zur Physiologie der Tuba Eustachii Grund einer Beobachtung von doppeleitigen organischen Verschluss der Rachenmündung derselben. Deutsche Zeitschrift für pract. Medicin, No. 44, 1878. D. observed a patient with great syphilitic destruction of the nasopharyngeal space. Cicatrix closed off the mouths of the Eustachian tube. Hearing was impaired and tinnitus present. During the act of swallowing both (most in left)

Mt. were observed to sink in with subsequent outward motion. The same was observed when the nose was held during deglutition. D. thinks the phenomena due to a dilatation of the tube in the act of swallowing, producing a rarefication of the enclosed air.

De Rossi, Researches on the Microorganisms in the Eustachian Tube of Healthy Individuals. Trans. 9th Internat. Med. Cong., pp. 859-862, 1887, Washington. In the secretions of the Eustachian tubes of twelve healthy individuals examined, the presence of germs was determined in six. None were of a pathologic character.

De Simoni, A., Intratympanic Injections in the Treatment of Chronic Middle Ear Catarrh. Arch. ital. di otologia, VII, p. 81. States good results followed use of vaseline oil and iodoform-ether through Eustachian tubes.

Duel, Arthur B., The Possibilities and Limitations of the Electrolytic Bougie in the Treatment of Chronic Catarrhal Otitis. Laryngoscope, XIII, 1903, pp. 523-532. Duel thinks this method pre-eminent as a method of restoring patency of the tube. Best results are obtained by employing it sparingly and in connection with other forms of treatment. Intervals of two weeks should elapse before repetition. Caution is advised against using too often, too strong, and too hurriedly. Small bougies, small current, time and patience are advised.

Duel, A. B., The Rapid Dilation of the Eustachian Tube by Electrolysis. Laryngoscope, III, 1897, pp. 31-37. The electrolytic action of the negative pole of the galvanic current is employed. It is applied by one of four copper bougies, Nos. 3 to 6 French, mounted on No. 5 piano wire. They are passed through insulated silver catheters.

Duel, A. B., An Additional Note on the Treatment of Strictures of the Eustachian Tube by Electrolysis. Laryngoscope, IV, 1898, pp. 116-119. Duel repeats that this treatment is not recommended for sclerosis, but only for narrowing of the tube. 20 to 40 volts are required of 2 to 5 amperes. The operator should satisfy himself that the catheter is in place by the rhinoscopic mirror, or by successful inflation before the introduction of the gold bougie. The silver catheter is insulated by rubber dressing. The bougie should be pushed past the constriction slowly, occu-

pying two minutes or more. The bougieing should not be repeated before a week or more, but inflations should be continued. Many cases seem to be cured by one bougieing.

DUEL, A. B., The Value of Electrolytic Dilatation of the Eustachian Tubes in Chronic Tubal Catarrh and Chronic Otitis Media. Amer. Jour. Med. Sciences, April, 1900. Many of the 50 reported cases were relieved or much improved as to the vertigo and tinnitus by restoration of the patency of the tubes. In nearly one-half the impairment of hearing was improved. The bougies are made of solid gold 2, 3 and 4 French scale. They should fit the tube snugly. The bougie is attached to the negative pole; the positive pole held in the patient's hand. Obstructions in the tube are overcome by using from 1 to 3 amperes of the current. After 20 seconds the bougie may be further introduced. It is not employed for more than five minutes at one time, and repeated at intervals of one week to one month, inflations being practiced every other day. Two to four sittings are usually sufficient. A battery of 30 to 50 volts is employed.

EITELBERG, VON A., Bougieing the Eustachian Tube. Tr. by Dr. Cornelius Williams. Archives of Otology, XIII, 1884, pp. 168-182. Eitelberg ascertained the average length of the Eustachian tube in adults as 36 to 44 mm. In the newly born the average is 19 mm. Eitelberg found that the penetration of the catheter amounted to from 6 to 11 mm. The longest tube measured among 15 fresh specimens was 48 mm.; the isthmus tubæ in this case was 28 mm. from the tubal orifice (pharyngeal end). The average distance from the ostium pharyngeum to the isthmus is 24 mm. The normal width of the isthmus is 1½ to 2 mm. In a case of chronic suppuration a bougie of large size (No. 4 Charrière) freely entered both tubes and could be made to present in the auditory canals. The average length of the Eustachian tube as measured on the living patients was about 35 mm. Stricture of the middle part of the tube is exceedingly rare. In three cases Eitelberg succeeded in passing a bougie of larger size further into the tube than the smaller bougie would penetrate. He thinks this is due to the smaller tube being more read-

ily engaged by folds of mucous membrane; also rotation on its long axis of a larger bougie more readily releases it. The infantile tube is both relatively and absolutely wider than the adult at its narrowest part, according to this author.

ESCHWEILER, On the Development of the Sound-Conducting Apparatus, with a Special Regard to the Tensor Tympani Muscle. Arch. für micr. Anat. XLIII, pp. 150-196.

FISCHENICK, FR., The Treatment of Catarrhal Adhesive Processes in the Middle Ear with Intratubal Pilocarpine Injections. Berlin. klin. Wochenschr., Vol. 37, 1900, pp. 1033-1034. Fischenick regards intratubal injections useful in sclerosis. Six to eighteen drops of a two per cent. solution are injected into each tube. Thirty to sixty sittings are given.

FERGUSON, H. LINDO, An Improved Form of Eustachian Catheter. Archives of Otology, XIII, 1884, p. 296. A flexible tube bent to the proper curve is used. Into this is passed a straight stylet. It is used where obstructions forbidding the use of the ordinary catheter are met with. On passing the obstructions the style is withdrawn, whereupon the catheter assumes its proper shape.

FOURNIÉ, EDW., Du Role physiologique de la trompe d'Eustache. Congrès periodique internat. d'otologie, 2d. Milan, 1880, pp. 119-126.

GOLDSTEIN, M. A., The Use and Abuse of the Eustachian Bougie. Laryngoscope, XIII, 1903, pp. 515-522. Goldstein regards them of value in all chronic middle ear affections. Counter-indicated when patient complains of "fullness" after use or when hearing is dulled by them.

GOMPERZ, Typical Alterations of the Tension of the Membrana Tympani in Valvular Occlusions of the Eustachian Tubes. Rept. 1st meeting, Aust. Otol. Congress. Wiener klin. Woch., IX, 1896, pp. 843-846. Bulgings of the postero-superior portion of the Mt. occur in otherwise normal Mt. and T. cavity. Symptoms occurring are sensations of pressure, tension, slight subjective noises and occasional deafness. With use of Siegle's otoscope the postero-sup. quadrant follows its compressions or rarefactions, but immediately jerks into its former bulged position. The most precautious blowing of the nose produces

a feeling of air striking the Mt. Therefore no impediment to the entrance of air exists, but one to its exit. In Gomperz's cases catarrh of the nasopharynx, hypertrophy of the mucous membrane, polypi or suppuration of the accessory cavities were found.

GRADENIGO, G., Diagnosis, Prognosis and Treatment of Progressive Deafness in Chronic Non-Suppurative Inflammation of the Middle Ear. Trans. by J. A. Spalding, Arch. Otol. XX, 1891, pp. 221-227. The contents of the tube were examined to ascertain the presence or absence of bacterial life in this disorder. The examination was negative, the only species of bacteria found were a few individuals of the bacteria of putrefaction commonly found in the air. (The same observations, elaborated, occur Centralbl. f. Bacteriol. und Parasitenkunde, VIII, 1890, p. 225.

GRADLE, H., On Headache from Overlooked Causes in the Nasopharynx and Ears. Jour, Am. Med. Assn., Vol. XI, Sept. 8, 1888, pp. 339-340. Gradle considers a certain type of continual headache, more commonly met in children, due to impaired patency of the Eustachian tubes.

GRUBER, J., On the Therapeutic Value of Injections of Medicated Solutions into the Eustachian Tube. Monatschrift für Ohrenheil, XIV, 1880, pp. 133-139. Solutions injected into the Eustachian tube soften, but do not dissolve mucus, so that it can then be more readily removed by catheter. They also benefit, by producing a new inflammation, in certain conditions. Gruber believes that injections detach synechiae extending from drum to tympanic walls or to ossicles, even when air douche has not benefited.

HAIKE, H., Tuberculosis Ear Disease in Nurslings. Deutsche med. Wochenschr., Vol. XXXI, 1905, pp. 954-957. In five fatal cases the duration of the lesion was several weeks or months. In two cases, the possibility of the infective sputum entering through the Eustachian tubes could not be excluded. In the others the ear lesion was primary. The port of entry was the mouth or pharynx. Moreover, the author states, the tube itself may be the seat of disease in nurslings, while in adults it is merely the path of tubercular sputum.

HAMMERSCHLAG, V., Respiratory and Pulsatory Movements of the Drum Membrane. 1st Austrian Otol. Cong. Report, in Arch, of Otol., XXV, 1895, pp. 408-409. The investigations were made with an instrument similar to that of Mach, upon four healthy young individuals, in 30 observations. He found the Mt. exhibits constant movements, coincident with the systole of the heart.

HAMMERSCHLAG, V., On the Function of the Eustachian Tube. Arch. für Ohrenheilk, XLIII., 1897, p. 65 (a reply to Lucae's article in Arch. f. O.). He believes the middle ear and nasopharynx are in open communication. [Hartman, in Arch. of Otol., XXVII, 1898, pp. 179-80, again shows the fallacy of this belief in a review of the article. During inspiration alone no equalization of pressure ordinarily occurs, but on deglutition equalization is restored. B.]

HAMMERSCHLAG, V., On the Reflex Movements of the Tensor Tympani and Its Central Paths. Sitzungber. der Wien Akad. Math-naturn, Bd. CVIII, 3 p. 1. The contraction of the tensor in dogs, is believed by Hammerschlag to be a reflex, passing through the auditory nerve and originating in sound waves. In addition to the tract between the eighth and the fifth nuclei of the same side there is one between the eighth nerve nucleus of the one and the fifth motor nucleus of the other. Contractions of the tensor tympani occur after removal of the entire brain cortex, hence is a pure reflex process.

HARTMANN, A., Function der Tuba Eustachii. Archiv. f. Anat. und Physiologie, 1874. Experiments regarding the amount of pressure necessary to inject air through the tubes under varying conditions. While the muscles were in a state of rest air entered at a pressure of 20 to 40 mm. column of mercury. During the act of swallowing, 20 mm. or less was sufficient. In only one of the individuals who submitted himself to the experiments, the Eustachian tubes were open in a state of rest and the membrana tympani were pressed outward at a pressure of 10 mm. of mercury.

HARTMANN, A., Mittheilung über die Function der Tuba Eustachii. Archiv. für Anatomie und Physiologie, 1877, pp. 543-548. Hartmann concludes that the act of swal-

lowing draws tense the membranous walls of the tube, transforming this previously flaccid canal into a rigid one, that the tube remains closed as long as the muscles of the soft palate are at rest. He states that the weight of 200 mm. of mercury by manometric measurement is incapable of causing air to enter the tube while the muscles are uncontracted; and he believes that the membranous wall is but pressed the more firmly against the cartilaginous anterior wall of the tube; but that this valvular action is overcome by swallowing. From within the middle ear, air readily escapes from the pharyngeal orifice of the tube, as is proved by the escape of air bubbles when a person in the penumatic cabinet is subjected to only slight rarefication of atmospheric pressure.

HARTMANN, A., Experimentelle Studien ueber die Function der eustachischen Röhre. Leipsic, 1879. Hartmann states that great condensation of the air in the nasopharynx opposes the opening of the tube, even during deglutition, by reason of the air pressure acting to force the membranous part of the tube against the cartilaginous roof. He proves that during respiration no interchange of air occurs between the tympanic cavity and pharynx in normal tubes. If abnormally patent there is an interchange, noticeable in a visible vibration of the Mt. coincident with respiration. Phonation may facilitate the passage of air, but does not do it so completely as deglutition. He accepts Zaufal's view that the act of deglutition moves the medial cartilaginous plate of the tube backward and medially. Thus the floor of the mouth of the tube expands by the separation of the lateral walls from each other. Simultaneously the prominence of the levator advances toward the orifice of the tube, which is thereby narrowed from above, downward, and from behind, forward. The sound-conducting power of the tube is but slightly discussed.

HARTMANN, A., Ueber die Bestimmung der Durchgängigkeit der eustachischen Röhre mit Hilfe des Quicksilbermanometers, Virchow's Archives, Bd. LXXIV, 1878, pp. 420-424. A repetition of the views expressed in his monograph on same subject.

HAUG, R., Foreign Body in the Tubular Region After a Pre-

vious Radical Operation. Tonsillar Abscess. Arch. f. Ohrenh., LVII, p. 45. A cotton pledget was lost in the depths of the auditory canal during the performance of a radical mastoid operation. An abscess of the peritonsillar tissue later appeared and on its evacuation the cotton pledget appeared. It was supposed to have reached its location through the levator muscle.

HEFLEBOWER, R. C., Clonic Spasm of the Tensor Tympani, N. Y. Med. Jour., LXI, 1895, pp. 325-328. A clicking noise, accompanied by twitching of throat muscles, was complained of. A perceptible indrawing of the central and lower part of Mt. was visible at time of each click.

HOLINGER, J., Spongifying of the Labyrinth. Laryngoscope, XI, 1901, pp. 31-35. An attempt is made by Holinger to differentiate between the diseases named and Eustachian obstruction. In Eustachian obstruction he gives predominant symptoms as: (a.) Retraction of the Mt., often extreme. (b.) Nose is affected by hypertrophies and subject to frequent colds. Pharynx is always examined with mirror and palate hook. (c.) Hearing distance increases after catheterization. Smokers' catarrh and stomach disorders affect the disease. In spongification of the labyrinth we have: (a.) Usually a history of deafness in family. (b.) The onset rarely begins before the age of 18 to 24. (c.) Sudden increase of deafness with heavy cannon shot noises. (d.) Mt. normal or nearly so. Nose, normal as a rule. Finally in the latter we have negative Rinné test, increased bone conduction for the lower sounds and a defect in hearing ability, mostly at the lower limits of the normal range.

HOPKINS, AGNES, On the Relative Dimensions of the Osseous Semicircular Canals of Birds. Biological Bulletin, Vol. XI, 1906, pp. 253-263. "The Eustachian tubes of birds have a common esophageal opening in all cases, except in the genera Struthio, Eudytes, and Tinamus, where there is a pair of apertures. The Eustachian tube is a perfect bony tube in the following: Sterna, Squatarola, Ceryle, Psittacus, Geococcyx, Tetraonidae, Phasianidae, Catharista, Falco, Eudytes and Tinamus. In all other cases it is imperfectly ossified."

HOPKINS, FRANK T., Electrolysis in the Treatment of Chronic

Eustachian Stenosis. Archives of Otology, XXXIV, 1905, pp. 495-501. Hopkins begins with a No. 1 bougie (French) and at intervals of from two to four weeks, repeated until at the expiration of several months the next size may be easily introduced. In the same way proceed to the use of Nos. 3 and 4, or even 5. Between the times of using the bougies, inflation with vapor or air is used. In the discussion (ibid., pp. 539-546) members gave varying opinions regarding the usefulness of the electric bougie. Some had found the bone bougie equally good or better than the electrolysis. Several cases in which the tip of the gold bougie had broken off in the tube, where they still remained, without the patient being apparently worse than before, were reported.

HOVELL, T. MARK, Catheterization of the Eustachian Tubes. Brit. Med. Jour., Oct. 22, 1898, p. 1238. The author here proposes (1) that the gauge of the Eustachian catheter be that of the French catheter gauge; (2) that the length of the curve of the instrument be expressed in millimeters, the number indicating the distance the curve separates two parallel lines.

HOVELL, T. MARK, Catheterization of the Eustachian Tubes. Archives of Otol. XXVIII, 1899, pp. 51-52. The need of a uniformity of scale in the measurements of Eustachian catheter is stated.

HUBBARD, THOMAS, An Apparatus of Precision for Inflating and Medicating the Tympanum. Archives of Otol., XXII, 1893, pp. 27-32. An instrument is described by which sterile air is used for politzerization or inflation of the Eustachian tubes.

JACOBI, A., Otitis Media in Children. Arch of Otol., XXXIV, 1905, pp. 90-101. Pyogenic microbes enter the middle ear chiefly by way of the Eustachian tube, which R. O. Newman finds, even normally, contains microbes. They enter especially when coughing, sneezing or vomiting. Mainly so when the nares are obstructed by swelling, by a membrane or by congenital occlusion. The vibrating epithelium of the tube becomes paralyzed in conditions of ill-nutrition, colds and atrophy. In the young, the Eustachian tube is shorter but wider both at the isthmus and at the tympanic orifice and the direction of the canal is almost horizontal.

JOACHIM, OTTO, Contribution to the Physiology of the Soft Palate, Archives of Otology, XVIII, 1889, pp. 226-234. The entire nose was destroyed by syphilis in a case of the writer's, giving easy view of the entire pharynx and mouths of the Eustachian tubes. The orifice of the left tube was impervious and occluded with a considerably reduced power of hearing on this side. The effect of various articulated sounds on the motions of the soft palate and Eustachian orifice was carefully studied by the author.

KAYSER, R., Contribution to the Pathology and Treatment of Objective Ear Noises which, according to their Mode of Development, are divided into Tubal and Real Ear Noises. Trans. German Otol. Soc., 4th meeting, 1895. Arch. of Otol., XXIV, 1895, pp. 328-329. "The tubal noises are either muscular or elsewhere developed, as in autophonia, but transferred by changes to the tube. He considers the first form allied to chorea and hysteria, caused by contraction of the tensor veli palati. He uses for treatment an irritation by pressing either the velum palati, mastoid process or the teeth, but with varying success. If the snapping noise is produced by the separation of the tubal walls, a probe is introduced with immediate good results which persisted in but three cases." A discussion on the possibility of hearing the noises produced by the contraction of the tensor tympani arose, but the views were discordant.

KENEFICK, JOSEPH H., Electrolysis in the Destruction of Organized Strictures of the Eustachian Tube. Archives of Otology, XXX, 1901, pp. 73-84. Kenefick concludes: (1) That it cannot be foretold in any given case just what result will follow this treatment, as this will depend largely on two comparatively unknown quantities, viz., (a) the vascularity of the tube lining and its toleration of the electrical interference, and (b) on the degree of tympanic involvement. (2) That tubal obstruction is present early in the great majority of cases of so-called hypertrophic catarrhal otitis media and that their mechanical obstructions may be removed at an early stage of middle-ear involvement with excellent results. (3) That the best means of reabsorption of an organized obstruction of the Eustachian tube is by the electrolytic bougie.

KERRISON, PHILIP D., Tinnitus Aurium. Kerrison classifies the various sources of tinnitus as due to: (1) Conduction sounds. (2) Blood sounds. (3) Labyrinthine sounds—alteration of intralabyrinthine pressures. (4) Neurotic sounds—increased irritability of the nerve. (5) Cerebral sounds—lesions of the cerebral cortex.

KIRCHNER, W., On Formation of Diverticles in the Eustachian Tube, in Man. Pt. I, from Festschrift für A. Koelliker, Leipsic, 1887. A specimen of an Eustachian tube was shown, presenting a diverticle, lined with thin, firm membrane. It was situated about 1.5 mm. from the pharyngeal opening, about the size and form of a small bean 7 mm. in diameter and 6 mm. deep and opening by a sinus into the Eustachian tube. The tube itself was unchanged in length or diameter, and the lining mucous membrane presented no considerable change. The author is unable to conclude whether the malformation was congenital or the result of morbid action.

KOENIG, On Passing Bougies in the Tubes. Trans. Seventh Int. Otol. Congress in Arch. of Otol., XXXIV, 1905, p. 348. Uses a combination catheter and bougie, the latter introduced into a small channel which opens into the caliber of the catheter. With a simultaneous application of the air-douche, performed by the patient with a double bag, the introduction of the bougie is performed more easily. A different catheter is used for each side.

KOSTANECKI, CASIMIR VON, The Pharyngeal Ostium of the Eustachian Tube and its Relation to the Nasopharyngeal Cavity. Arch. f. mikrosc. Anat., XXIX, 1887, p. 539-592, pll. II. Some abnormal cases are related. Kostanecki observes that the pharyngeal tonsil may extend to the tuberosity of the Eustachian tube and even into its ostium.

KYLE, D. BRADEN, The Position of the Orifice of the Eustachian Tube and the Possibility of Catheterizing it through the Mouth. Phil. Med. Journal, II, Sept. 24, 1898, pp. 622-626. A catheter for use through the mouth is made of coin silver, six inches in length and flexible. The patient depresses the tongue with a tongue depressor while the operator locates the tube with a mirror and introduces the catheter.

KYLE, J. J., Natural Gas and Eustachian Inflammation. Jour. A. M. A., XXX, 1898, pp. 658-659. Natural gas, containing a large proportion of sulphuretted hydrogen, is regarded as most irritating to the nasal and tubal membrane.

LAKE, RICHARD, Abnormal Course of the Chorda Tympani Through the Tympanic Cavity. Lancet, Jan. 5, 1895, p. 28. Exit at usual level, ran horizontally forward to lowest ¼ of malleus handle, thence upwards, passing through canal of Huguier and keeping below the tensor tympani.

LANCEREAU, Infection of Syphilis by Means of the Eustachian Catheter. Union Med., XLI, 1886, pp. 469-474.

LARYNGOSCOPE, THE, Is the Eustachian tube open or closed during the Act of Deglutition? Laryngoscope, closed! Editorial, Laryngoscope, III, 1897, p. 190-191—a comment on Dr. Stillson's paper.

LAVAL, Nasal Auscultation of the Ear During Catheterization. Archiv. für Ohrenh., LXVI, 1901, p. 120. By means of a hearing tube introduced high up in the opposite nostril, during catheterization, differential diagnosis is aimed at between the sounds heard at (a) the tubal ostium, (b) the tube, and (c) the tympanum. The latter are not heard by nasal auscultation, but only by aural. The sound of removing secretions from the tympanum through the tube is heard by nasal auscultation. Noises in Eustachian tube are heard equally by nasal and aural auscultation. The greatest amount of crepitant rale is produced by the escape of the exudate. The blowing noise is produced in the cartilaginous tube. Its character depends on the form of the tubal secretion. Rough blowing murmurs are produced by swelling and moisture in the mucous membrane of the tube.

LERMOYEZ, M., and HELME, F., The Staphylococci of Otorrhea. Annales des mal. de l'oreille du nez et du phar., XXI, 1895, pp. 35-58. A discussion as to the appearances of microorganisms in ear diseases preceding or following acute inflammations in ear.

LINHART, C. P., Rapid Dilatation of the Eustachian Tube. Columbus Med. Jour., XXV, 1901, pp. 345-351. Electrolysis is the method employed and recommended.

LOCKARD, L. B., The Eustachian Bougie. N. Y. Med. Jour.,

Dec. 29, 1900, pp. 1127-1129. Reviews the indications for, and the advantages and disadvantages of, the instrument. It is recommended in two conditions only; stenosis and tinnitus.

LUCAE, AUGUST, Zum Mechanismus des Gaumensegels und der Tuba Eustachii bei Normalhörenden. Archiv. für path. Anat., Bd. LXXIV, 1878, pp. 238-245. Lucae states that the mouth of the tube is compressed when the soft palate rises and is opened when it falls; hence, that a sort of pumping action of the tube is effected. He also believes it probable that an internal dilatation of the tube accompanies the external closure of the tube.

MARSHALL, GEO. M., What Can Be Accomplished by Treatment of the Eustachian Tube. Jour. A. M. A., XXX, Mar. 19, 1898, p. 656. Bougies, smeared with nitrate of silver, 15 grains to an ounce of lanolin, are recommended for chronic stenosis of Eustachian tubes. They are left in place 20 to 30 minutes, not more than twice a week. Seven cases were greatly improved, five moderately, five no change.

MATLACK, E., Electrolysis in Eustachian Salpingitis with Stricture. Report of seventy-five cases. American Medicine, Vol. 5, Feb. 7, 1903, pp. 223-224. Electrolysis is regarded as of service in all forms of deafness (excluding pure labyrinthine conditions), and especially so in cases of moderate degree, where the greatest changes are located in the tube. More improvement resulted than by any other treatment, how permanently is not yet known.

MCKERNON, JAMES, Distressing Tinnitus Relieved by Bougieing the Eustachian Tube. Arch. of Otol., XXIX, 1900, pp. 394-395. The negative pole of a galvanic current was used in connection with a gold bougie, passed well into the tympanum. The current was 30 volts, 3½ milliamperes; contact, 2½ minutes. The tube was not strictured. Recovery was immediate and lasting.

MELZI, URBAN, On the Use of the Hard-Rubber Bougie in Chronic Affections of the Eustachian Tube and the Middle Ear. Arch. Internat. de Laryngol. d'Otol. et de Rhinol., Vol. XV, 1902, pp. 81-87. Melzi cured three cases of O. M. C. C. by slow dilatation of the Eustachian tube by hard-rubber bougies.

McAULIFFE, GEO., Dilatation and Stenosis of the Eustachian Tube. New York Eye and Ear Infirmary Reports, Jan., 1898. Two cases, one of unusual dilatation and the other of stricture of the Eustachian tubes.

MÉNIÈRE, E., The Use of Rubber Bougies in the Treatment of Chronic Catarrhal Affections of the Eustachian Tubes and the Middle Ear. Arch. Internat. de Laryng. d'Otol., etc., XI, 1898, pp. 31-36. Ménière assumes that catarrh of the Eustachian tube is the primary lesion which later causes middle ear changes. Uses bougies and recommends them. They are dipped in potassium iodide and iodine solution. He leaves them in place one-half minute to one hour. In two cases not improved by regular catheterizations, hearing was much improved.

MÉNIÈRE, E., De la dilatation intermittente et progressive de la trompe d' Eustache. Franc. méd., I, 1889, pp. 445-448. (On the intermittent and progressive dilatation of Eustachian tube.) Ménière, after employing bougies for fifteen years, praises their use. Instead of withdrawing the tube he uses a method of his own; that is, he bends forward the patient's head, forcing it to slide out of itself.

MÉNIÈRE, E., Catheterization of the Eustachian Tube (reply to discussion), Gaz. des Hôpiteaux, Vol. 59, 1886, p. 268. Ménière uses only silver catheters, which he disinfects by keeping them in a vessel filled with alcohol. Before use, the catheter is exposed to an alcohol flame. It is then dipped in cold water and cleansed with a copper wire.

MÉNIÈRE, E., On the use of Rubber Bougies in Chronic Catarrhal Affections of the Eustachian Tube and the Tympanum. Moscow International Conference, Arch. of Otol., XXVII, 1898, pp. 97, 98. "Chronic inflammation of the Eustachian tube is the most frequent cause of gradually progressive loss of hearing. In these cases, repeated insufflations of air often have no effect, though sometimes a marked improvement is produced by passing the bougies. The elastic bougies are the only serviceable ones; the end must be conical, and pass through a catheter of 1½—2 mm. breadth. The following solution is used: Iodine pur., iodide of potash, each one grain, distilled water 13 grains. The bougie may remain in position 1 to 60 minutes. Irritation is slight; occasionally burning in the nasopharynx will be complained of."

MIOT, C. Reflection sur l'obstruction de la trompe chez un diabetique. (Remarks on the Obstruction of the Eustachian Tube in a Diabetic Patient. Société franc, d'otologie, April 15, 1887.) Miot states that cases of ear trouble in diabetics are caused by swelling of the Eustachian tube. They vary in deviation and intensity. Some are curable, in others the tube is permanently obstructed. Miot believes the constant current allays the congestion of the tube and renders possible the introduction of bougies (and the application of the galvanic cautery).

MICHEL, C., Neue Beobachtung über das Verhalten der Rachenmündung der Tuba and über die Thätigkeit der Muskulatur des Schlundkopfes. Berliner klin. Wochensch., 1875, pp. 558-561. A patient, 20 years old, lost the entire nasal septum, permitting direct observation. On swallowing, the posterior surface of the soft palate came into view, pressing laterally between the cartilaginous projections of the Eustachian tubes and rising convexly against the posterior pharyngeal wall. Simultaneously the projections of the cartilages were elevated, their lower border approaching the median space of the pharynx; while, behind them, on the posterior pharyngeal wall appeared two projections rising from 1 to 1¼ cm. above the surface of the palate and having a smooth surface 1 cm. wide between. On forcible deglutition this intermediate space disappeared and the mucous membrane presented additional folds. During phonation the appearance was much the same, except that a thick fold appeared on either side at the junction of the posterior and lateral pharyngeal walls. On sounding the vowel a, the palate was nearly flat; with e, i, o, u, it rose considerably above this level. The anterior border of the Eustachian opening remained nearly motionless, except that below it there appeared a slight fold, which was lost in the border of the palate, moving backward and forward during the act of swallowing. When at rest the Eustachian opening appeared like a furrow, the lower portion of which formed a triangle, the walls above lying in contact. The act of swallowing was accompanied by a wave-like motion on the floor of the orifice, then an elevation, the floor of the tube rising into the opening; and at the height of the act, the

moment of greatest elevation of the floor, the furrow opened, presenting the appearance of a dark triangle, the apex of which was lost in a black line extending upward. During phonation the cartilaginous projection of the tube moves backward, and its lower border is elevated by the upward pressure of the floor. The orifice opens only during the singing of the high i or e, as with these vowels the palate is forcibly elevated and the floor of the Eustachian opening pressed upward. On sounding these vowels both the cartilage projection and the velum vibrate forcibly, and the transmission of these vibrations to the osseous portion of the tube and to the ear may explain in great measure the singing sound heard on sounding and holding the high i. The cracking sound heard on swallowing may also be explained by the movement of the cartilage of the tube. [This conclusion, I believe, is erroneous. It is caused by the drawing apart of the lips of the mouth of the tube.]

MOLINIE, J., Defect of the Lips of the Eustachian Tube and Atresia of the Pharyngeal Tubal Ostium. Report of Trans. 7th Int. Otol. Cong. in Arch. of Otol., XXXIV, 1905, p. 327. (Also in Bull. de laryngol., otol. et rhinol., VII, 1904, p. 187.) Molinie saw two cases of contraction of the nasopharyngeal isthmus with atresia of tube. Both cases he thought due to too energetic use of galvanocaustic applications.

Moos, S., Klinik der Ohrenkrankheiten, Wien, 1866. The folds in the lining mucous membrane of the Eustachian tube are most numerous at its lower portion and form a bulging just behind the pharyngeal orifice which aid in the closing of the tube.

Moos, S., A Preliminary Notice on the Anatomy and Physiology of the Eustachian Tube. Arch. Ophthal. and Otol., I, 1869, pp. 716-717. Believes tube is closed while at rest by an intumescence at the pharyngeal orifice.

Moos, S., The Histological Changes of the Eustachian Tube in Chronic Catarrh. (Trans. by Dr. A. N. Blodgett.) Arch. Ophthal. and Otol., V, 1876, pp. 542-560, pll. I and II. A case treated for Eustachian tube stenosis, at intervals for 10 years, came to autopsy. Normal and pathological anatomy of the tubes described.

Moos, S., Beiträge zur normalen und pathologischen Anatomie und zur Physiologie der eustachischen Röhre. Wiesbaden, 1874, p. 53, pl. VI. The tube when at rest is closed at a point just behind the funnel-shaped end of the faucial opening, and this closure extends through about two-fifths of the length of the canal. On the lower surface, or floor, of the tube the closure is effected by the longitudinal folds of mucous membrane, which form a considerable prominence, really a valve of variable size. On the opposite surface of the canal, below the cartilaginous hook, in the lower portion of the canal, is another prominence of mucous membrane smaller than the other. These have their analogy in the lower animals. They probably facilitate the patescence of the canal by their unrolling. The cartilaginous "islands" of the tube are divided into five classes, the most important being those on the floor and sides of the tube. Those on the sides consist always of fibrocartilage. They assume here the function of sesamoid bones in the tubal mechanism through their attachments.

Myles, R. C., Adhesions Connecting the Eustachian Tube to the Pharyngeal Wall Above. Arch. of Otol., XXVI, 1897, pp. 322-323. Two cases reported in which there were adhesions connecting the Eustachian tube to the walls of the pharynx, forming a number of cavities (recesses?). The adhesions were torn with the finger with relief of symptoms.

Nicoladoni, C., Beobachtung am Lebenden uber die Bewegung der Tuba Eustachii. Monatschr. für Ohrenheilk., Aug., 1875. A favorable opportunity for observing the movements of the Eustachian tube was presented by the performance of an operation on a tumor of the nasopharynx by first removing the upper jaw. "Simultaneously with the contact of the soft palate with the posterior pharyngeal wall, its posterior surface being almost in line with the floor of the nose the medial portion of the tube, about one millimetre in height, began its movement while the lateral portion appeared to remain at rest. The movement, rather rapidly performed, consisted in an elevation for about three millimetres of the lower prominent edge of the medial portion, which appeared to be

also drawn backward and slightly toward the median line. At the same time the lower boundary of the fossa of Rosenmüller became sharply marked and projected into the median space, an arcus salpingeus, the apex of the tube, remained at rest." A bubble formed of blood serum formed over the orifice of the tube. At each act of swallowing this bubble sank into the depth of the Eustachian tube to reappear immediately on the completion of the act.

PETER, The Eustachian Tubes and Their Appendages in the Mammalia. Arch. für microscop. Anat. XLIII, 1894, pp. 327-376.

PIERCE, NORVAL H., On the Value of Electrolysis in the Eustachian Tube. Arch. of Otol., XXXI, 1902, pp. 289-296. A good anatomical demonstration of the tube. The conclusions of the writer are that (1) in otosclerotic disease electrolysis is useless; (2) in the great majority of cases of catarrhal disease, it has no advantage over other methods of treatment; (3) in a certain few cases where there is probably a soft exudate near the isthmus, it may be regarded as of some value.

RANDALL, B. A., The Prime Effect upon the Ear of Nasal Stenosis. Phila. Polyclinic, IV, 1895, p. 173.

RANDALL, B. A., The Technic and Value of Catheter Inflation of the Tympanum. Phila. Polyclinic, VII, 1898, pp. 551-552. Randall expresses confidence in its use.

RANDALL, B. A., Clinical Anatomy of the Eustachian Tube. Laryngoscope, IX, 1900, p. 82. There is little variation in the topography of the surrounding parts. The back edge of the hard palate is practically unvarying. The lumen of the tube is a slit, usually collapsed and devoid of its "safety tube" at its inner third, while a valve-like fold in its bifurcated lower part serves with the drag of the relaxed palate, to insure its closure.

RANKE, H., Case of Malformation of the Ear. Sitsungsber d. Ges. f. Morphol. und Physiol. in Munich, No. 2, 1889, p. 68. The case examined postmortem revealed the meatus ending in a blind tube. The tympanic cavity was entirely absent. The Eustachian tube was rudimentary and ended blindly.

REITMANN, KARL, On the Structure of the Cartilage of the

Eustachian Tube in Man. Monats. für Ohrenheilk., XXXVIII, 1903, pp. 45-50. The cartilage of the Eustachian tube of the new-born is a typical reticular cartilage. In the adult the elastic fibers surround the cartilage cells. Occasionally there are vascular channels in the cartilage, which generally carry veins. The fatty degeneration of the cartilage, occasionally appearing, is regarded by the author as responsible for the fragmentation of the tubal cartilage."

DE ROALDES, A. W., Otological Peculiarities of the Negro. Rev. de Laryngol. et d' Otol., XV, 1895, pp. 1169-1182. Among other differences noted, the mouths of the Eustachian tubes are stated to be larger, the nasopharynx much more spacious, deafmutism rarer.

ROURE, M., On the Passage of Bougies in the Tubes in Cases of Dry Middle Ear Catarrh. Bull. de laryngol., otol., et rhinol., VII, 1904, p. 250. Uses a steel bougie and a modified catheter.

ROYET, Adhesions of the Eustachian Tube to the Posterior Pharyngeal Wall as a Cause for Progressive Sclerosing Otitis and Symptoms of Vertigo. Archiv. Internat. de Laryngol., d' Otol., et de Rhinol., XVII, 1904, pp. 371-397. The cause of progressing deafness is assigned by Royet to the broad adhesions of the pharyngeal opening of the Eustachian tube to the posterior pharyngeal wall. After division of these adhesions with the finger the author believes he has observed cases of recovery, improvement or at least a bar to its progress.

RUMBOLD, THOS. F., Functions of the Eustachian Tube. St. Louis Medical and Surgical Journal, July 20 to September 5, 1880.

RUMBOLD, THOS. F., Remarks on the Inflation of the Middle Ear. Laryngoscope, II, 1897, pp. 291-294. Rumbold believes two objects are accomplished by inflation with the Politzer bag: (1) removal of a plug of mucus from the tube of the middle ear cavity; (2) restoration of the normal atmospheric pressure of the middle ear.

SCHADE, Migration of a Nail from the Nasopharynx into the Middle Ear. Deutsche med. Wochenschr., XXVIII, 1902, p. 796. Four years previously the patient extracted a nail from a box with his teeth. He swallowed the nail

and suffered pain in his throat for some time. Attempts at extraction failed. Lately after a violent motion sudden pain occurred in the left ear, and in three days the patient was able to extract the nail out of the ear. It was 12 mm. long, 1 mm. thick and bent in the middle. [There seems to be no proof that the nail passed through the tube.—B.].

SCHWALBE, G., Text-book of the Anatomy of the Organs of Special Sense. 2nd part, 2nd half, Erlangen, 1886. Schwalbe agrees that the greater portion of the cartilaginous tube is closed in a state of rest. It represents a closed vertical fissure, which every now and then is opened either by the simultaneous action of the tensor and levator palati or by the tensor alone. The orifice may also be opened by the tensor alone, independently of the act of swallowing. The levator is (thus) presumed to act by virtue of the fact that the belly of the muscle is thickened, in the region of the tube, by its contraction, and so the walls are pressed apart. Contraction of the muscular fibers of the posterior-superior portions of the tube alone does not enlarge the orifice of the tube; this rather elongates the vertical fissure, smooths out the folds on the m. m. of the floor and thus fixes that portion of the tube wall.

SCHWABACH, D., On the Pathological Anatomy of Deafmutism. Arch. of Otology, XXXII, 1903, p. 378. The case described was that of a deafmute who died of acute miliary tuberculosis. The mucous membrane of the bony Eustachian tube was very much thickened and infiltrated with small round cells in the superficial parts and in the deeper parts in the neighborhood of the tympanum.

SCHUMACHER, H., Wratsch Gaseta, No. 19, 1902, in a paper, Ear Disease in Abdominal Typhoid, states that ear complications from typhoid are more common in children; that infection reaches T. by the way of the blood and Eustachian tube, and that syringing of the nasopharynx is to be avoided because of the liability of forcing the passage of secretions through Eustachian tube to T.

SCHWARTZE, Gehör-organ, pp. 103-104. A luxuriant tubercular growth surrounding the pharyngeal recess (fossa of Rosenmüller) on one side was observed. The recess itself was converted into a crater-like excavation twice the depth of its fellow.

SIEBENMANN, F., On the First Appearance of the Auditory Ossicles and the Tubotympanic Space in Man. Report Proc. 3rd meeting German Otolg. Soc., 1894. Arch. of Otology, XXIV, 1895, p. 56. "Examination of human embryos of the 3rd to 6th, 8th week showed that the blastem of the cartilaginous capsule appears in the 4th week, that of the annulus stapedialis in the 5th and that of the malleus and incus in the 6th week. Even at the earliest stage the blastem of the annulus stapedialis lies near the labyrinth capsule as well as the dorsal end of the fore-cartilage of the second pharyngeal arch. The stapes is not of double origin. The space corresponding to the medial wall of the tympanic cavity exists at the first month as an undifferentiated portion of the pharyngeal cleft, a separation of the tubotympanic space taking place in the first half of the second month by the nearer approach to each other of the dorsal and ventral wall of the pharyngeal cleft and by the advancement of a solid mesodermic layer, closing the tympanic cavity below."

SIEBENMANN, F., Results of the Functional Examination in Cases of Pure Catarrh of the Eustachian Tubes. Trans. by E. B. Dench. Arch. of Otology, XXII, 1893, pp. 12-16. Bezold found 9 per cent. of pure tubal catarrh among his entire series of cases. Two isolated reports of Bezold treat of the symptoms of tubal catarrh. In a large number of cases catheterization showed no secretion in the middle ear. Mt. was usually depressed, but no signs of inflammation. On inflation the Mt. resumed its normal appearance and hearing was improved to a marked degree. Before inflation hearing distance for whisper was greatly diminished, 10 to 500 cm. (normal distance, 15 metres). In Weber's test the sound was referred to the affected ear. Weber-Schwabach test marked increase in bone conduction in affected ear. Rinne's test was positive in only two cases; in all others, negative. Upper tone limit was below normal. Lower tone limit was usually curtailed. Inflation produced an increased hearing distance. In fact, only cases showing marked improvement by the procedure were considered in this class of cases. Schwabach's test was only slightly altered. The results obtained by Rinne's test were shortened or reversed, be-

coming positive in all but two cases. The upper tone limit remained unchanged in half the cases. The lower tone limit was increased. Bone conduction remains stronger after inflation. This latter phenomenon is regarded as due to the hyperemia ex vacuo always present in tubal catarrh. In consequence of this hyperemia there is likewise a rigidity of the annular ligament of the stapes, even after the aspiration position is corrected. This rigidity does not disappear for some time. It is possible to assume that the portion of the scala vestibuli lying near the oval window serves to affect the perception of the highest notes; that this part suffers from passive hyperemia and that this cannot be removed immediately but only gradually.

STENGER, P., On the Etiology and Treatment of Sclerosis of the Middle Ear. Deutsche med. Wochenschr., XXIX, 1903, pp. 513-514. The process is regarded as an inflammation originating in the nose and pharynx, thence extending through the Eustachian tube to the ear.

STILLSON, HAMILTON, Experiments on the Eustachian Tube by means of the Tongue Thrust Into the Nasopharynx. Laryngoscope, Vol. III, 1897, pp. 38-47. The experiments of Hammerschlag (1st Aust. Otol. Cong.) are criticised. Stillson by means of the manometer shows that contrary to Hammerschlag's belief, during the time the Eustachian tube is actually open throughout its length the Mt. moves extensively outward during expiration and inward during inspiration. Stillson is able to introduce his own tongue behind his palate and so, at will, to close the tubes completely with his tongue. On thus closing the tubes all motion of the Mt. ceases in both inspiration and expiration. (2) With the mouth closed, i. e., with the Eustachian tubes as normal, the manometer shows the phenomenon mentioned by Hammerschlag. Now the index in inspiration moves outward; in expiration, inward. In breathing through the nose the excursions of the Mt. are more extensive than with mouth respiration. This same excursion of the membrana tympani takes place in the same way when the tongue pushes forcibly into the nasopharynx and completely closes the Eustachian tubes. Likewise the motions synchronous with the heart beats

occur whether the tongue closes the Eustachian tube or not. Stillson says it is therefore evident that the "respiratory" movements and pulsatory excursions have nothing to do with the rarefaction or compression of air in the tympanic cavity through air passing directly through the tube in normal respiration. Stillson thus concludes that the Eustachian tube is normally closed during deglutition. Stillson does not know what causes this reverse movement of the drum in normal respiration, but suggests that the cause is due to the increase of blood pressure in the head on inspiration and to lowered pressure on expiration. By noting the behavior of the pharyngeal mouths of the tubes with the aid of the tongue Stillson finds that in swallowing, the pharyngeal portion of the tube is drawn up and pushed up so as to be tightly coapted to the end of the introduced catheter. This is chiefly accomplished by the constrictor muscle. Politzer's conclusion from experiments with the manometer are also regarded by Stillson as in error, Stillson believing that the increased sound of a vibrating tuning fork held in front of the nose during the act of swallowing is due to condensation of the air in the tube and ear, and claiming that pressure of the tongue into the mouths of the tubes completely closing them, produces a similar effect.

STIRLING, ALEX. W., Itching of the Auditory Meatus. Laryngoscope, VIII, 1900, p. 146. Stirling thinks itching of the meatus of the ear is sometimes caused by irritation from inflammation or irritating applications at the pharyngeal end of the Eustachian tubes.

TANSLEY, J. OSCROFT, A Piece of Bougie in the Eustachian Tube. Laryngoscope, XIII, 1903, pp. 36-40. A bulbous point of a bougie was found in the mouth of the tube where it had broken off. The method of treatment is also disapproved of by the author.

THOMSON, ST. CLAIR, Approximation of the Remains of Luschka's Tonsil and the Eustachian Cushions. Laryngoscope, IX, 1900, p. 58. Thomson believes "Sinuses in the vault of the nasopharynx" were nothing but depressions produced, as the title of his communication describes, by the approximation of the remains of Luschka's tonsil and the Eustachian cushions.

TRUCKINBROD, C., A Malformation of the Ear. Archiv. of Otology, XIV, 1885, pp. 128-132, pl. II. In this case of marked deformity, there existed complete closure of auditory canal, middle ear very small, rudimentary ossicles. No trace of a drum membrane was found, solid bone being found in its situation. Eustachian tube was present. The tube had a large, quite uniform diameter throughout its length. Its vertical diameter at its opening into the tympanic cavity was 4 mm. Its length 2.4 cm., 1.4 cm. of which belongs to the bony tube. No isthmus tubae proper was found; its diameter at this situation was 2 mm. The tympanic cavity appeared as a considerable expansion of the extremity of the tube.

UFFENORDE, W., The Auscultation of the Middle Ear. Arch. für Ohrenh., LXVI, 1902, p. 1. No diagnosis can be made by means of the distinctions of the sound, as to whether it is due to tubal or middle ear condition, as it may meet an obstruction which may absorb or reflect sound waves. (2) The blowing noise comes from the end of the catheter and the tube, the middle ear acting as a resonator. (3) No conclusion as to the consistency of the secretion can be drawn from the musical character of the sound. (4) Rales from the middle ear have a deeper note and a secondary sound due to the secretion falling backward. The tubal rales are higher and fewer. (5) If no auscultation sound is heard in a moist catarrh, the obstruction is usually in the tube. (6) Under ordinary conditions most of the secretion leaves the middle ear via the Eustachian tube. (7) A whistling noise indicates secretion, but gives no clue as to the size of perforation. In two cases the presence of crepitant rales during catheterization suggested the presence of an exudate in the middle ear. On incising the membrane, no fluid was found. Uffenorde then investigated the subject of the generally accepted opinion regarding exudates of the tympanum. He used a fresh cadaver and disarticulated temporal bones. He finds it impossible to determine with the otoscope whether the sounds heard are near to, or far from, the ear of the observer. A vesicular murmur is produced principally at the end of the catheter and at the walls of the tube. The tympanum serves as a resonator. The musical char-

acter of the crepitant rale does not inform us as to the character of the secretion. Crepitant rales produced in the tympanum is regarded as due simply to changes in position of the secretion. This accounts for an unusual intensity of sound and by a musically lower note. The lower after-murmur is due to the secretion falling back into its former position. Tubal noises are higher and less intense, corresponding to the smaller amount. The bursting of air bubbles can only explain a part of the secondary noises. If there is moist catarrh present and an auscultation murmur is perceived the obstruction is probably tubal [!]. Conditions being favorable, removal of the discharge from the tympanum is probable of accomplishment through the tube into the epipharynx. If the amount is small its evacuation is of importance. In the presence of a perforation, whistling murmur denotes secretion, but it is not necessarily related to the size of the perforation. A perforation murmur may occur with an entire absence of the drum.

URBANTSCHITSCH, V., Bougieing the Eustachian Tubes in Chronic Disease of the Middle Ear, Especially in Chronic Middle Ear Catarrh. Wiener med. Presse, Vol. 24, 1883, pp. 48-73. After chronic middle ear catarrh there often remains a narrowing of the tube, especially at the isthmus, though the entrance of air is not much interfered with. He regularly uses bougies, on examination, in diagnosing O. M. C. C., employing the French bulbous bougies. He advocates the dilatation of all tubes in cases of impaired hearing and subjective noises in which a bougie 1 1-3 mm. diameter cannot enter the bony portion or where it enters with great difficulty. Improvement takes place, he believes, by a reflex influence generated by the irritation of the sensitive twigs of the trigeminus, especially the tubal branches. This influence, he thinks, extends to all the senses, and, of course, to the ear. He employs the bougies in chronic suppuration when associated with narrowing of the isthmus tubæ.

URBANTSCHITSCH, ERNST., Vibratory Massage of the Eustachian Tube in Chronic Middle Ear Catarrh. Monatsch. für Ohren., XXXVII, 1903, pp. 89-96. The thin celluloid bougie is introduced to the isthmus of the tube; then ex-

ternal massage is employed by means of a pad set in motion by a motor, and continued four minutes. Urbantschitsch thinks circulation is improved in tensor tympani and tubal muscles and in middle ear. He reports improvement of subjective noises.

URBANTSCHITSCH, V., An Apparatus for Friction Massage of the Ear or Eustachian Tube. Monatsch. f. Ohren., XXXVI, 1902, pp. 455-467. An apparatus is constructed which has two electric magnets on a rod, arranged to convey various movements to the mucous membrane of the mouth of the tube and the nasopharynx.

VAJDA, V., Syphilitische Infection der Tuba Eustachii. Bericht der Klinik für Syphilis des K. K. Allgemeinen Krankenhauses, Wien, 1875. A case of syphilitic infection at the mouth of the tube from an infected Eustachian catheter.

VALENTIN, AD., The Cystoscopic Examination of the Nasopharynx or Salpingoscopy. Frankel's Arch. für Laryngol., XIII, 1903, pp. 410-420, Taf. XXII. The condition of the tubal ostium, upper wall of the nasopharynx and the posterior surfaces of the velum are rendered visible by a cystoscope-like apparatus introduced through the nose.

VALI, On Objective Noises of the Ear. Arch. für Ohrenheilk., LXVI, 1906, p. 104. Objective noises usually develop from an abnormal circulation or tonic and clonic contractions of the muscles of the tympanum and in the pharynx. A case synchronous with pulse was not arrested by pressure on the carotid, but was stopped by depression of the tongue, by elevation of the soft palate and by catheterizing the tube. Regarded as due to clonic contractions of tensors and palate muscles.

VOLTOLINI, R., Two Peculiar Ear Diseases. Monatschr. für Ohrenheilk., XVII, 1883, pp. 1-6. A twenty-year-old patient had for five years sensations of sudden valve-like closures of the ears lasting for some time. At these times examination revealed a thin atrophic Mt., bulging outward and containing frothy mucus. By negative Valsalva the Mt. was made to withdraw against the inner T. wall. By slightly swallowing, the first condition reappeared. Diagnosis: Dilatation of the Eustachian tube with exudation, confirmed by insertion of catgut bougies. Respiratory vibration of the Mt. was noted. On pronunciation of the letter R, a fluttering vibration was developed.

VOLTOLINI, R., On the Catheterization of the Eustachian Tube in Cases of Palatal Fissure, and the Inspection of the Nasal Cavity from in front while it is being illuminated from behind. Monats. für Ohrenheilk., XVIII, 1884, pp. 7-8. In a patient with a cleft of both soft and hard palate, the posterior lip of the tube, but not its mouth, was visible through the oral cavity.

WARNECKE, G., Simple and Vibratory Catheterization with a Current of Carbonic Acid Gas. Archiv. für Ohrenheilk., LXVIII, 1904, pp. 227-232. The gas is led by a tube to the catheter. The intermittent current is thought more active than the continuous.

WHITE, F., Complete Deafness for Twenty-four Years from Eustachian Closure. Perfect recovery after a course of Politzerization. Brit. Med. Journal, March 2, 1895.

WOLF, OSCAR, Review of Hartmann's "Experimentelle Studien ueber die Function der eustachischen Röhre." Archives of Otology, VIII, 1878, pp. 209-211. He cites Hartmann's experiment showing that a slight pressure from within the middle ear only is necessary to overcome the closure of the tube, as a support to his theory that the Eustachian tube is protective by furnishing an outlet for sound waves. Loud sounds would, he thinks, produce grave changes in the ear without it.

WOLF, OSCAR, Sprahe und Ohr., p. 240. Wolf states his experimental proof that the tube is for the outlet of sound—a protective mechanism. It permits the sound waves to escape from the rigid walls of the osseous tympanum into the external air.

YANKAUER, SIDNEY, Eustachian Sounds. Archives of Otology, XXXV, 1906, p. 247. The sounds described and here recommended by Yankauer are made of catgut surrounded by a resin. They bear sterilizing. They are not bulb-pointed. They are ringed near the proximal end for convenience in determining the distance introduced.

ZAUFAL, E., Die Plica Salpingopharyngea. Prague med. Wochenschrift, Vol. IV, 1879, pp. 217-227. Calls this fold the ridge-fold. He observes that it projects forward in (swallowing) movements as a sharply defined medial fold of variable thickness. It extends 3—5 centimeters downward and backward as a direct continuation of the

tubal convolution. When the head is bent backward it can be directly observed with the aid of an uvula retractor.

ZAUFAL, E., Die Plica Salpingopharyngea. Arch. für Ohrenheilk., Vol. XV, 1879-80, pp. 96-144. The various diseases affecting the fold are described. It is the seat of pronounced swelling and tumefaction. Cystoid follicles may develop in it, which tend to obstruct the mouth of the tube.

ZUCKERKANDL, E., Zur Anatomie und Physiologie der Tuba Eustachiana. Monatsch. für Ohrenheilk., VII, 1873, pp. 125-145. Bundles of fibers, tendinous and elastic, pass from the pharyngeal end of the tube to connective tissue of the levator palati, the muscles of the pharynx and soft palate. These aid in drawing open and closing the orifice as different muscles are contracted.

ZUCKERKANDL, E., Anatomische Notiz über die Tuba Eustachiana eines Elephas Indicus. Monatschr. für Ohrenheilk., IX, 1875. There is no projection on the pharyngeal wall to mark the opening of the Eustachian tube in this animal, and it is discoverable only with some difficulty. It is almost exactly vertical. The ostium pharyngeum possesses no distinct cartilaginous boundary and appears as a small, irregular slit, the thick lateral wall longer than the membranous, median wall. The tubal cartilage is thicker above, assumes the form of an almost complete cylinder nearly surrounding the tube at its median portion. The tube is fixed to the skull by a comparatively slender fibrocartilage.

ZUCKERKANDL, E., Contributions to the Anatomy of the Organ of Hearing. Reviewed in Arch. of Otology, XIV, 1885, p. 211. On dissection; a small piece of bone, the size of a hemp seed, was found in the anterior wall of the Eustachian tube, the pharyngeal orifice being otherwise normal. The spicule was firmly adherent to the mucous membrane, and Zuckerkandl regards it as a circumscribed ossification of the cartilage. (Moos has published similar findings.) Accessory cartilaginous plates in the floor of the Eustachian tube, in the pharyngeal prominences, the lateral walls, in the ligaments connecting the cartilaginous portion of the tube with the vault of the pharynx are so commonly found as to be considered normal.

ZUCKERKANDL, E., On the Eustachian Tube of the Ant-Eater.

Monatsch. für Ohrenheilk., XXXVIII, 1904, pp. 1-7. Zuckerkandl differs from the view of Hyrtl (1845) that the bony tube is absent in Myrmoscophaga jubata. Zuckerkandl finds a bony tube 15 cm. long without any cartilaginous filament attached to the margin of an opening in the temporal bone by which it communicates with the tympanum. Zuckerkandl thinks Hyrtl mistook this opening for the carotid foramen.

ZUCKERKANDL, E., On the Anatomy of the Eustachian Tube. Monat. f. Ohrenheilk., XL, 1906, pp. 1-11, etc. In these papers Zuckerkandl gives results of his studies of the comparative anatomical characteristics of this region. The greatest differences are in the structures of the tubal walls, especially of the median walls. The lateral walls are approximately uniform, and usually fibrous. The median walls show varieties from fibrous to cartilaginous. In the lower forms of vertebrates the median walls are usually fibrous, showing that the primitive tube was represented by a fibrous tube.

ZUCKERKANDL, E., A Contribution to the Comparative Anatomy of the Eustachian Tube. Arch. f. Ohrenh., XXXIII, 1886, pp. 201-213. The Eustachian tube of the Ornithorhynchus paradoxus or Duck-billed Platypus, is not tube-shaped, but is represented by a simple fissure, which connects the tympanic cavity with the slightly pouched pharynx. All other mammals examined have a tube-shaped structure. This animal thus resembles in this structure the amphibia, the batrachia in general exhibiting a similar connection between the ear and the pharynx.

ZUCKERKANDL, E., The Eustachian Tube of the Tapir and Rhinoceros. Arch. f. Ohrenheilk., XXI, 1884, pp. 222-232. The Eustachian tubes of the tapir are remarkable by reason of a smooth, narrow-edged air-sac, the size of a hen's egg, situated about 8 mm. behind the pharyngeal opening of the tube, extending upwards 45 mm., connecting with the cartilaginous portion of the tube and reaching posteriorly 22 mm. beyond the auditory organ. The comparatively small amount of hyaline cartilage in the tube is placed at the superior wall, and projecting downward medially and laterally form here a sort of groove. The medial wall contains fibrous cartilage as support. The

levator palati is pushed outward by the air-sac. The membranous lining of the tube presents numerous ridges, especially on its floor. It contained no acinous glands, but adenoid tissue in the shape of follicles were found. The air-sacs resemble those found in the horse. The Eustachian tubes of the rhinoceros were found in the adult to be 89 mm. long. In the neighborhood of the junction with the bony tube a vascular network exists formed by arterial twigs from the internal carotid and distributed into the cavernous sinus. The hyaline cartilage has the typical shepherd's crook shape. The narrowest portion of the tube is near the middle of its length. Bundles of fibrous tissue containing some hyaline cartilage cells strengthened the cartilaginous tube. The mucous lining of the tube was paved with ciliated epithelium; contained acinous glands in its deep layers and adenoid tissue superficially.

X.

WHY THE FAILURES AFTER RADICAL MASTOID?

By John F. Barnhill, M. D.,

Indianapolis.

I cannot proceed with this paper without first expressing to the officers and members of the section a feeling on my part both of gratification and regret—gratification from the honor of the invitation to appear before so distinguished a body of specialists, and regret because at this time, when your city is celebrating in a most magnificent and befitting way the accomplishment of some of the greatest feats in the world's history, I am unable to bring to you any new message or highly useful application of an old or well-established principle. I consented to come before you because a rather intimate knowledge of the work that has been done and is daily being accomplished by the individual members of the society was to me a guarantee that I should receive from my brief association with you here a renewal of the intense and earnest inspiration to accomplish greater things, which is an asset so necessary in the practice of an art so difficult as that of ours.

At a session of a noted association of gynecologists, at which I happened to be present, a heated discussion arose concerning the results of a certain operative procedure, and the statement was made by an overzealous member that he had operated an almost incredible number of times without having witnessed a single failure from his method. A colleague, in answer to this statement, said that whereas his apparently faultless brother had never witnessed a failure following his favorite procedure, other operators, including the speaker, had several times had such opportunity, probably for the reason that when failure resulted, the patient often chose to go to another physician for further treatment, rather than return to him whose pet operation had been performed and whose failure it was. Judged by the private statements of several otologists, that failure to cure, following the radical mastoid operation, in their hands seldom

or never occurs, it must be true, to some extent at least, that the mastoid surgeon, like those practicing gynecology, is often deceived as to the actual number of his uncured cases, but has opportunity to observe more failures among the cases of his fellow operators than his own. However this may be, it is probably true that should we honestly analyze the ultimate result of our entire work, few among us could say in truth that they had never witnessed failure in our own practice following the tympano-mastoid operation. My own experience in this respect probably differs little from others, in that I have seen failure to cure following operations that had been performed by those eminent in the specialty, as well as by those but slightly known or ont at all known. It must be, therefore, that some rather constant cause or group of causes is responsible for disappointing results, and that definite and possibly avoidable reasons for failure may be present in all cases. Granting this to be true, a brief statement and discussion of these causes may be helpful to those of us who are anxious to do more perfect work, but who have not, as yet, mastered a perfect plan.

Failure of the radical mastoid operation to cure chronic suppuration in the temporal bone, or its environs, may be due to an anatomic anomaly of the osseous structure in the particular case. It may be the result of indifferent asepsis at the time of the operation, but chiefly during the period of after-care. It is almost inevitable following a faulty technic or an incomplete operation; it is not unknown following the work of skilled operators who neglect the proper and personal after-care of the wound.

Failure due solely to an anomalous structure of the temporal bone occurs rarely, no doubt, and in instances where the mastoid cellular labyrinth is of great extent and leads into depths at which operative procedures cannot be carried out with safety. There are well-described specimens in which normally the pneumatic spaces reach not only a large portion of the temporal bone, but extend, also, into the substance of adjacent bones, in one notable example of which, the specimen of Dr. Wales, direct communication seems to exist between the cells of the temporal bone and those of the sphenoid and occipital. When suppuration occurs in any patient whose mastoid cells are of this character it is obvious that operative procedures directed toward a cure cannot always be extensive enough to include

all the diseased structures. The beginner and timid operator are almost certain to meet failure in such case, and even the expert surgeon may suffer a like result, for the reason that structures may be involved in the disease around which or through which the boldest and most skillful operator dares not go.

Incomplete Operation and Faulty Technic.—I am aware that what may seem faulty technic in the work of one surgeon may, to that surgeon, prove a satisfactory means of securing the most desired end, namely, the cure of the patient. This is true, for the reason that it is undoubtedly possible to do inferior surgery and yet ultimately succeed because of the untiring and intelligent after-care that is given the patient. I shall not at this time, therefore, discuss the merits of any given procedure, merely stating that it is entirely essential to success, whatever plan is followed, to adhere to a technic most nearly ideal in general surgical principle, which, in case of the mastoid operation, insures the removal of the diseased structures, provides the greatest possible are of integumentary covering for the denuded bone, and finally, which guarantees the greatest ease of subsequent inspection and after-treatment of the wound.

An analysis of the cases of failure I have seen has shown that more than one-third were due to incomplete operation; that all the diseased structures had not been removed. This was especially true of the external attic and antral walls and of the deeper osseous areas in proximity to the facial ridge and horizontal semicircular canal. In a few instances it was noted that the chief cause of the continued suppuration was due to the fact that the osseous postmeatal wall had not been removed to sufficient depth, that it had not been smoothed and rounded, and that it projected into the antroaural cavity as a ridge, too sharp and too high to admit the growth of a perfect and permanent epithelial covering. Normal granulation and epithelial structures seem entirely incapable of climbing and covering sharp ridges of bone, or of satisfactorily spreading into pockets having acute, angular or overhanging walls. Failure is constantly invited, therefore, in any case in which the operator allows such ridges, angles or pockets to remain in the operated wound.

Every surgeon who operates frequently on the accessory suppurative sinus affections is aware of the fact that failure to

cure as a result of any operative procedure is almost inevitable in any case in which even a small portion of the old pyogenic membrane is left behind. This is true, whether the failure to rid the suppurating cavity entirely of its diseased membrane be in the frontal or maxillary sinus; and the same rule of failure holds equally good in case any of the diseased membranes of the middle ear or antrum is left behind.

Many operators have, no doubt, witnessed failure in their own as well as in the cases of others, due to continued patency of the eustachian tube, and to the consequent outpouring into the tympanic cavity, especially during nasopharyngeal colds, of thick, string, mucous or muco-pus. The fault is due to lack of thoroughness or skill in dealing with the tympanic end of the tube at the time of operation. And yet in some cases in which it was believed at the time of operation that every necessary care had been bestowed toward that end, closure had not followed, and the aural discharge continued. In some cases this is undoubtedly due to a state of obstruction and infection of the tube at its pharyngeal end. In this respect the situation may be aptly compared to that of radical operation on the suppurating frontal sinus, in which operation, we are all now agreed, I think, that cure cannot be expected from the most radical operation on the sinus alone unless the anterior ethmoidal cells, when diseased, are at the same time thoroughly eradicated. Likewise, therefore, the presence of adenoids, other obstructions, or nasopharyngal inflammation may be responsible for the continued discharge from the patent tube, and it has demonstrated that the middle ear will often speedily dry up without further treatment, provided the environment of the nasopharyngeal end of the tube is put right. It has certainly not been satisfactorily proven that a patent tube is of itself especially harmful, whereas its continued patency adds something to the comfort of the patient and to an increased ability to hear.

Postoperative suppuration occasionally sets up many months after the operation, and after the ear had for a long time been dry, as the result of an accumulation in the cavity of a semi-cholesteatomatous mass due to rapid cell proliferation and exfoliation. The irritation and pressure of such a foreign body, if allowed to remain indefinitely, may cause ulceration and permanent discharge, but usually a flow due to this cause should not be reckoned among the causes of permanent failure.

Failure to cure because of failure to remove every diseased structure is by some operators justified on the ground that it is far better for the patient to suffer the continued annoyance of a moderate, though perhaps innocent discharge, rather than run the risk of facial palsy, distressing vertigo, sinus infection or death, any of which may result from a reckless and determined effort on the part of the surgeon to eradicate every vestige of the disease. Such caution is on doubt at times wise for the master operator, and is undoubtedly proper in case the surgeon is a novice, or is not thoroughly grounded in the anatomy of this region.

Failure to cure in several observed cases seemed clearly due to the fact that the operator in fashioning the skin flaps had not provided a sufficiently spacious opening into the operated cavity through which subsequent inspection and treatment might at any time be made. My observation on this point leads to the rather positive conclusion that it is highly essential in a majority of all mastoid operations to provide ample means for observing daily, if necessary, the behavior of every part of the wound until epidermization is complete, for should there be neglect in this respect, carious areas may form, riotous granulation tissue spring up, pockets capable of retaining septic material may form, and, before the surgeon is aware, the new structures may break down completely with resulting failure. It seems evident, therefore, that the relationship between the size of the meatal opening provided by the mastoid operation and the successful postoperative treatment and final cure is very intimate, and that no amount of zeal on the part of the operator in the after-care of the patient can compensate for failure to leave a proper window for inspection, because if the meatus be not enlarged, all posttreatment must be given blindly and therefore inefficiently.

Excessive or long-continued packing of the osseous cavity, though perhaps not a frequent cause of ultimate failure, is, however, no doubt responsible for prolonged healing in many cases and for failure in some. Prolonged packing is fortunately not now employed so frequently as formerly and should, no doubt, be abandoned altogether, except at the first dressing, when support is necessary to insure adhesion of the skin flaps.

Neglect or indifference on the part of the operator to the progress of the granulation and epidermization is responsible

for many of the failures after tympanomastoid exenteration. The healing of an open osseous wound, unless the same has been successfully skin-grafted, can seldom be left entirely to nature's plan of repair. Indeed, the satisfactory management of the epidermization process often requires the exercise of as much care and judgment on the part of the surgeon as does the operation itself. This part of the after-treatment can, therefore, rarely be left to untrained physicians, whether the same be the family doctor or hospital interne, without running a serious risk of failure to cure. My own observation on this point is that on one, unless he has served a studious and adequate apprenticeship in the care of osseous wounds, is at all capable of having full charge of the postoperative care of the radical mastoid, and this, on doubt, accounts for the failure sometimes observed in the patient who goes from the rural district to the metropolis for the operation by the most skillful surgeon, but who is suffered to return home to the family physician or perhaps to mere household after-management before healing is complete.

All who have studiously watched the progress of repair in a large number of cases following the tympanomastoid operation, are aware that the behavior is often most surprising in that the granulations will sometimes bridge across some portion of the cavity, especially at the aditus ad antrum, in an incredibly short time, and occupy such position as to hinder drainage, favor infection and speedily end in disintegration of the new structures, with possible death of the underlying bone. Should granulation behave thus to the detriment of proper healing, prompt recognition of the fact by the experienced surgeon, and the immediate institution of suitable measures to correct the error usually ends in no permanent harm. On the other hand, if the fault is not promptly recognized and efficiently corrected, it matters little that a most thorough and painstaking operation had been previously performed; for all will now result disastrously unless a secondary operation is undertaken, and then more watchful after-care is given.

I have not mentioned failure due to lues, tuberculosis and certain diathetic diseases, for the reason that failure here in a considerable percentage of all operations on patients so affected must be looked upo nas inevitable. In addition to causes here noted contributing to failure, it has been my observation that

cases sometimes occur which do not get entirely well, even though every recognized principle in modern surgery has been followed and the most careful and competent after-care is given; and this, too, in individuals who are apparently free from constitutional disorder of any kind. It is not easy in such case as this to assign a definite cause of failure.

XI.

INTRANASAL MEASUREMENTS WHICH INDICATE THAT PALATAL EXPANSION INCREASES THE WIDTH OF THE NASAL FOSSAE.*

By E. E. Foster, M. D.,

New Bedford.

The exact factors in the causation of deformities of the superior maxilla and the relationship between these deformities and imperfect nasal breathing have given rise to a large amount of discussion and varied opinions.

Certain writers believe that these deformities are dependent upon the type of the skull, while others believe that they are due to influences during development.

The former opinion is championed particularly by Siebenmann[1] and his scholars, Fraenkel[2], Grosheintz[3] and Haag[4]. They devised an instrument (palatometer) with which they measured the width of the alveolar arch and height of the palatal arch of different individuals with and without "adenoid vegetations," this being the principal cause of nasal obstruction which they considered. From these measurements they calculated an index, and by comparing these indices they arrived at the conclusion that individuals with "adenoid vegetations" had relatively the same height of palatal arch as normal, and are of the opinion that the high palatal and V-shaped alveolar arches depend upon the type of the skull. The normal type (chamoprosope) is the broad face with the wide nasal cavities and dome-shaped palate. The abnormal type (leptoprosope) is the one with a high, narrow face, narrow nasal cavities (leptorhine), high palatal arch and V-shaped alveolar arch. They believe these types depend upon the congenital racial characteristics of the skull, and not upon the extrauterine influence of nasal occlusion.

*Read at a meeting of the New England Otological and Laryngological Society, November 29, 1909.

Siebenmann says, in explanation of the common association of palatal deformity with mouth-breathing: "That the individual with a high palate, without exception, has narrow nasal cavities, and the swelling of the nasal mucous membrane which is rarely absent with "adenoid vegetations" becomes more obstructive when the palate is high and narrow than when low and broad; consequently oral respiration is seen more often in individuals with a narrow face."

This view has been confirmed in part or in whole by Brackett[5], Bentzen[6], Arnold[7], Swain[8], Hurst[9] and Buser[10] by measurements upon the faces and skulls of European, Malay, Hawaiian and Flathead Indian races, before and after death.

In support of the opposing theory: that the deformities of the superior maxilla are due to influences during development, we have a long list of writers[11] [22], a large number of whom consider imperfect nasal respiration as the most important factor, and explain its influences in the following manner:

During normal nasal respiration the lips are closed, the teeth of the opposing jaw are in contact, and the tongue completely fills the oral cavity with the exception of a small space between the dorsum of the tongue and hard and soft palate. This space, according to Metzger[23] and Donders[24] has a negative manometric pressure of from 2 to 4 mm.

In this position the muscles are in a state of balance or tonicity which, in accordance with the generally accepted opinion, maintains the relative position of the jaws to each other. The muscles of the lips and cheeks on the one side and the tongue on the other exert equal pressure upon the alveolar arch.

If the nasal respiration be obstructed by any cause interfering with the free passage of air, the nasal respiration is partly or completely abandoned; and, as a result, air must pass through the mouth, a cavity not intended for such use, and certainly unfit to properly prepare the air for the lungs.

When nasal respiration is impossible, the mouth must perform two functions during the ingestion of food: that of preparing the food for the stomach, and supplying air to the lungs.

The baby at the breast requires about fifteen or twenty minutes for the ingestion of a single meal. Under normal conditions it does not remove its mouth from the breast during

that time, but, if nasal breathing be impossible, oral respiration must be resorted to, and as a result the baby can suck the nipple only a short time before partial asphyxia forces it to stop nursing. This procedure is repeated until hunger is satisfied, or, more often, the baby is exhausted by its efforts to supply the stomach and lungs at the same time. Either a moderate amount of milk mixed with air is swallowed, or an insufficient amount of nourishment is taken. Both tend to produce indigestion and malnutrition.

It is an established fact that oral respiration is not so deep and long as nasal, and as a consequence the interchange of gases within the lungs is not so complete. This allows an excess of carbon dioxid to remain in the blood, and a deficiency of oxygen to be absorbed. Kyle[19], confirms this latter statement by his findings in a series of examinations of the blood of persons with nasal obstructions. He found in every case, before removal of the obstruction, a reduction in the number of red corpuscles, the hemoglobin was found to be only 50 to 60 per cent of the normal, and in many cases there was a slight increase of the white corpuscles.

After nasal respiration had been established the cells and hemoglobin gradually returned to their proper number and percentage.

Oral respiration also interferes with sleep. Instead of a quiet, restful sleep, it is often interrupted with sudden awakenings and exhausting dreams.

Thus we frequently find as a result of oral respiration, indigestion, due to improperly prepared and digested food; impoverished blood, resulting from an incomplete exchange of gases within the lungs; and insufficient sleep which so weakens a growing child that not only is dentition delayed and decay of the teeth started, but the bony framework of the head and body is retarded in growth, and the resistance of the whole body is lowered to the invasion of pathogenic bacteria.

There are also the following local factors resulting from imperfect nasal breathing which are supposed to influence the shape of the developing superior maxilla:

1. Absence of the mechanical force of the air upon the walls and sinuses of the nose, and the abeyance of the natural functions with the want of proper blood supply.

2. Lack of constant apposition of the upper and lower teeth;

which destroys an important factor in forcing outward the teeth of the superior maxilla.

3. Continual downward and inward pressure against the lateral teeth by the muscles of the cheek, which support the hanging mandible, and the absence of the backward pressure of the orbicularis oris muscle upon the anterior teeth.

4. Loss of the vacuum between the upper surface of the tongue and hard palate, which in accordance with the findings of Metzger[23] and Donders[24] must tend to pull the palate downward.

5. Absence of the constant lateral pressure of the tongue against the alveolar arch, which has a regulating and widening influence.

As a proof of the theory that the interference of nasal breathing does have an influence in the abnormal development of the superior maxilla, the experiments of Ziem[25] and Collier[26] may be cited. Ziem found that by artificially occluding one-half of the nose in young animals there occurred an asymmetrical development of the two sides of the nose and adjacent bone tissues, the obstructed half being undeveloped. This arrest of development extended to all adjacent tissues on that side. Collier produced deformities of the upper jaw in young animals, chosen indiscriminately, by blocking their noses for a long time with cotton wool.

As additional evidence of the influence of oral respiration upon the upper jaw, I will briefly report the condition of two of my patients. One was a girl seven years of age, whose brother and sister had normal arches and occlusion. The mother was a strong, broad-faced Swede. Father dead. This child fell from a chair when a baby, striking on its face. When I examined the child, December, 1905, I found the cartilaginous part of the septum bent in such a way as to obstruct both nasal passages. The child had breathed through its mouth since the accident.

The other patient was a boy seven years old. His parents were both large, with normal heads. His brother and sister both had normal arches and perfect occlusion. The mother knows of no accident to account for an irregularity of the external shape of the nose, but says the child has breathed through its mouth for a long time. On examination, January, 1907, I found an angular deviation of the cartilaginous sep-

tum, obstructing both nasal cavities. This irregularity is certainly the result of trauma, and of long standing.

Both patients had a high palatal arch, V-shaped alveolar arch, a moderate degree of malocclusion and decay of nearly all the upper teeth.

Faught[27] cites the case of a football player who developed a markedly contracted upper arch after a traumatic deviation of the septum which interfered with nasal breathing. Models of the upper jaw had been made a few years prior to the accident. These showed practically a normal arch and occlusion.

Lack[28] reports a case which seems to prove the influence of muscle pressure. A boy, twelve years of age, who was a mouth breather. He had had facial paralysis on the left side for ten years; the soft parts were consequently flaccid. The teeth on this side were normal in their position while those on the other side were irregularly placed and crowded.

The only appartnt factor in this case which could cause a difference between the two sides was the facial paralysis which removed the tension of the cheek on the paralyzed side.

Of the other causes of palatal deformity during development, rickets has a prominent place. Löwy[29] believes the changes of rickets are the cause of all irregularities of the superior maxilla and nasal septum, while Marfan[30] and Stone[31] are of the opinion that these irregularities are more dependent upon rickets than any other single factor. Talbot[32] states that the causes of the arrest of development of the maxillary bones and irregularities of the teeth are the influence of eruptive diseases and constitutional disorders, and those of local origin. He does not believe mouth breathing has any influence on the shape of the upper jaw, and states that every case of adenoid growth and irregularity of the teeth will be found to be a case of degeneracy, shown by want of development in the bones of the face and jaw.

It has been rather generally accepted that idiocy and degeneracy are characterized by irregularities of the palate and teeth. This, however, has been partly, if not completely, disproved by the work of Channing and Wissler[33]. They conclude from measurements made of a large number of cases of the mouth of both normal and abnormal individuals, that deformities of the palate occur in the normal as well as the

feeble-minded, and show only a slight difference in degree, but not in the type.

Premature loss or prolonged retention of the deciduous teeth, tardy eruption or loss of the permanent teeth and supernumerary teeth usually produce irregularities of the alveolar arch and often affect the palatal arch. The nasal cavities may or may not be altered. This depends largely upon the extent of the oral change. Mosher[34] believes these irregularities in the eruption of the teeth and their faulty occlusion explains fully half of the cases of asymmetry of the hard palate. He is also of the opinion that non-shrinkage of the premaxillae is a cause of the high arch.

Since the blood and nerve supply comes largely through bony foramina, D. Braden Kyle[35] queries if this supply may not be insufficient for proper development if the size of the foramina is affected by injury or malformations.

Certain habits, such as thumb-sucking, biting the lower lip and holding the tongue between the upper and lower incisors have also been considered factors in deforming the growing jaw.

From the foregoing varied opinions it is evident that the etiology of nasal and dental irregularities and their interrelation is still indefinite. I believe, however, that we can safely conclude that prenatal influences tend to produce in certain individuals a narrow head with associated narrow nose and jaws, and that postnatal influences may interfere with the normal development of the nose and jaw, producing irregularities in one or both.

The interrelation and the ratio one bears to the other is undetermined as yet.

The indications for treatment in the acquired cases are very clear. First, correct any abnormality, either growth or deformity, interfering with nasal respiration.

Second, have an orthodontist expand the palatal arch and produce normal occlusion.

The treatment of a patient with a congenital narrow face is quite another problem, as here one is usually obliged to sacrifice normal tissue to establish perfect nasal breathing.

If the statement so often made be true, that the widening of the palatal arch widens the nasal cavities, then the indications would be to expand the arch, which would enlarge the

nose and establish in the majority of cases normal respiration unless the pharyngeal tonsil be enlarged. Some orthodontists even claim that nasal obstruction from "adenoid growth" will be relieved by palatal expansion.

The uncertainty of the effect of palatal expansion upon the nasal fossa and the inability to understand how the nose could be widened by such a procedure, led me to make intranasal measurements with the object of proving or disproving such assertions.

These measurements were made with internal calipers between the inner surfaces of the inferior turbinates, a little posterior to their anterior third, after the mucous membrane of these bodies had been shrunken with cocain and adrenalin.

Measurements were made on several individuals at different times until it was found that the average variation was about one millimeter.

For more than a year I used a simple form of calipers, determining the distance by applying them to a millimeter measure. Then I had Meyrowitz make me a form of calipers (turbinometer) which would record while in position the distance the instrument was placed in the nose as well as the distance between the turbinates. This has not been of any advantage over the simpler form. I use Myles' nasal speculum, one blade in each nostril, to expose the two turbinates.

During the two years that I have been making these measurements, I have been able to follow only two cases where palatal expansion was accomplished. One, male, 21 years of age, consulted me April, 1907, for difficulty in nasal breathing.

He has been more or less of a mouth breather for many years. On examination I found that his alae were flat, dilator muscles only partly developed, the septum nearly straight, the turbinates normal, but the cavity on each side of the septum was very narrow. No pharyngeal tonsil, and only a remnant of the faucial tonsils. The palatal arch was high, and alveolar arch narrow. Moderate irregularity of the teeth of the upper jaw, with malocclusion. Face of the narrow type, with prominent thin nose.

As the nasal cavity could not be made larger without the sacrifice of normal tissue, and as the alveolar arch was narrow, I advised him to have the arch widened, and if nasal respiration was not improved, then resort to nasal surgery.

Dr. Nesbett, of New Bedford, began to widen this patient's arch the first of May, 1907, and completed the widening after the third month. Jackson's spring wire appliance was used for the expansion, and a similar device for retaining same. Pressure was increased about every ten days.

Measurements showed an expansion of 10½ mm. between 2nd bicuspids, 9½ mm. between 1st molars, and 5½ mm. between 2nd molars. The distance between the inner surfaces of the two inferior turbinates, after the mucous membrane had been shrunken with cocain and adrenalin was 14 mm. at the time expansion was begun. Five months later, two months after expansion had been stopped, the distance between the turbinates was 17 mm., an interturbinal widening of 3 mm. Five months later, a few months after the retaining appliance had been removed, the measurement was still the same.

The patient is now able to breathe very well through the nose, and does not need intranasal interference. He has gained eighteen pounds in weight.

Model 1 was made when expansion was begun, model 2 when expansion was completed, and model 3 was recently made. These models show very clearly the change that has taken place in the mouth.

My other patient is a male 19 years of age, who consulted me February, 1908, on account of difficulty in breathing through the nose. On examination the septum was found deviated to a moderate degree. The turbinates were nearly normal. The pharyngeal tonsil had been removed some years previously without improvement. Remnant of faucial tonsils. His alveolar arch was narrow, palatal arch high, teeth moderately irregular and the so-called "open bite."

Knowing that the teeth should be attended to at once and remembering the results of my above reported patient, I advised having the regulating attended to first, and if necessary intranasal work later. After several months time he consulted Dr. Rogers of Boston, who reports to me as follows: "This extreme type of malocclusion has had several factors in its development: general neglect in the care of the teeth during early childhood, improper nasal breathing; and habits of the thumb and tongue. The thoughtless dentist has his share also, because he extracted the first and second molars on the right side of the lower jaw. To obtain and retain proper occlusion is difficult in this case."

Oral treatment was started May, 1908, at which time model 4 was made. Model 5 represents the condition of the mouth six months later.

Intranasal measurements made May, 1908, showed a distance of 11½ mm. between the inner surfaces of the lower turbinates, November, 1908, six months after palatal expansion and dental regulation had been in progress, the distance had increased to 13½ mm., an interturbinal widening of 2 mm.*

Dr. Rogers says the patient will remain under treatment about six months longer, when a fairly accurate result will be obtained.

The patient already notices improvement in breathing.

The first case is a representation of the leptoprosopic type of skull. His father's face is of the narrow type.

The second case is apparently of the acquired type, although his father and one sister have contracted arches with irregularly placed teeth.

Two cases are not a sufficient number from which to deduct definite conclusions, but with the observations of the orthodontists, that nasal breathing becomes normal or is improved after palatal expansion, and reports of cases by the rhinologists, as Black's[36], there seems to be but little doubt that the conditions of the nose are favorably influenced by the correction of palatal and dental irregularities.

How the apparent widening of the nasal cavities is accomplished is very difficult to explain, especially in the two adult cases reported. A purely mechanical explanation does not seem plausible unless it be in the very young.

By referring to Figures 1 and 2 we find less than one-third the length of the teeth exposed for the application of force. If force were applied to this third and its action were only mechanical, we would first have a tilting of the teeth with their alveolar processes and second a separation of the intermaxillary suture in the young, with possibly a stretching of the palatal bones in the adult, provided there were no external structures to prevent. There is, however, a very strong buttress, made up of the malar and frontal bones, which would prevent any such outward movement, particularly in the adult.

*Through the kindness of Dr. Rogers I have been able to-day (November 29, 1909) to measure the distance between the two turbinates, which was found to be 16 mm., an interturbinal widening of 4½ mm.

An examination of Figure 2 only, which is a section made through the roots of the second molar, would seem to disprove this statement were it not for the fact that this apparently very weak structure extends forward but a short distance. In this region of the second and third molar, expansion is rarely needed.

Figure 1 more nearly represents the region where expansion is required, and the structures that would oppose any purely mechanical foroce.

The skilled orthodontist tilts the teeth and their processes but little if any and never separates the intermaxillary suture unless intentionally. It is, therefore, evident that mechanics alone do not explain the widening.

To illustrate the absence of tilting and separation of the suture, I would like to show two models of a patient of Dr. Rogers.

Model 6 represents the upper arch of a boy twelve years of age, showing lack of growth. There is a history of "adenoid growth" and a septal spur. Both defects were removed about the eleventh year, with no special improvement noticeable in the nasal respiration after the operation.

Model 7 represents the same arch about eighteen months later. Dr. Rogers says: "This case cannot fail to impress one with the immense amount of development which has taken place under the stimulation of properly applied appliances. During the treatment a gradual improvement in nasal respiration was noticed."

Measurements taken high up in the vault of the arch of the first model opposite the bicuspid teeth and at the same place on the other, indicate very conclusively that the teeth have not been tipped and the apices have not remained in their former position but have been carried far beyond. The approximation of the central incisors proves that the intermaxillary suture was not separated.

If the vault of the palatal arch is widened by expansion of the alveolar arch, as is so well shown in models 6 and 7, and less so in 1, 2, 4 and 5, is it not reasonable to infer that the floor of the nose must also be widened? Clinical observations at least serve to confirm this, and my measurements add evidence toward a proof.

The most reasonable explanation of these changes, it seems

to me, is that the application of force to the teeth stimulates growth of the bony tissue of the alveolar arch, palate and nose.

To show, in another way, the influence slight pressure has upon bony formation I have made a cast of the face of one of my patients, who is a boy about 17 years old. He has had, according to his statement, interference with nasal breathing for several years. Examination showed both nasal cavities filled with polypi, filling in the cleft between the septum and outer wall of the nose. These soft structures have stimulated to growth the nasal process of the maxillary and nasal bones.

If such soft tissues can alter the shape of these firm nasal bones, is it not reasonable to suppose a more definite force, as that used by the orthodontist, can also alter the shape of the palatal bones, and consequently the lower part of the nasal cavities?

CONCLUSIONS.

1. Palatal and dental irregularities are usually associated with imperfect nasal respiration, which they may cause or be caused by.

2. Intranasal measurements contribute evidence toward the proof that widening of the palatal arch widens the nasal cavities.

I wish to acknowledge my indebtedness to Drs. Nesbett and Rogers for their help and advice.

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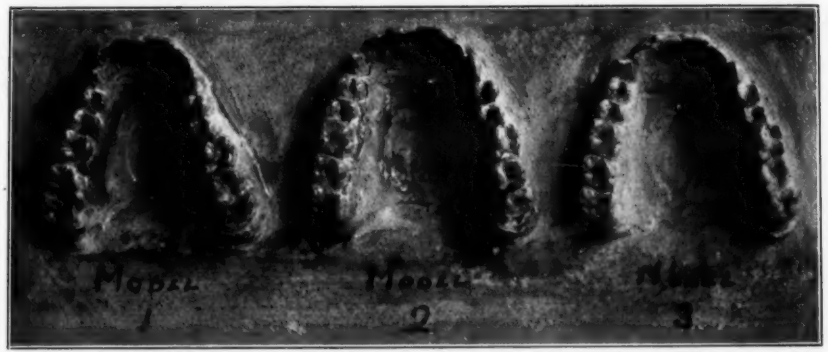
CALIPERS.



MODEL 1. MODEL 2. MODEL 3.

MODEL 4.

MODEL 5.

FIGURE 1.

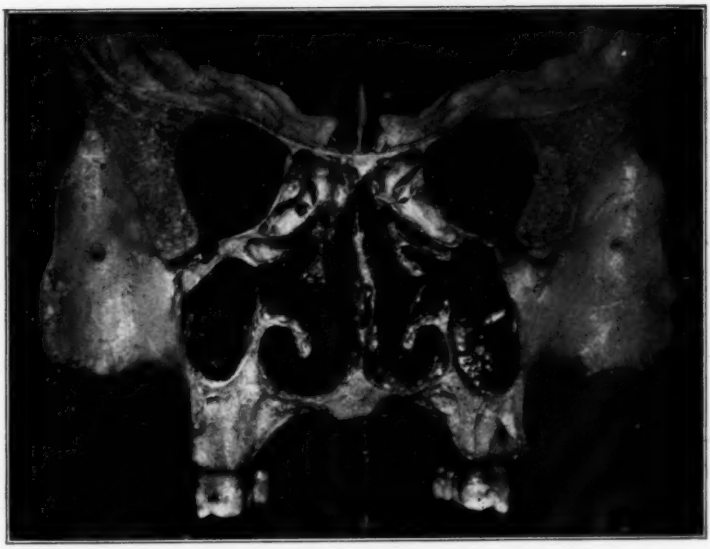


FIGURE 2.

MODEL 6.

MODEL 7.

CAST OF FACE.

XII.

SINUS THROMBOSIS OF OTITIC ORIGIN AND ITS RELATION TO STREPTOCOCCEMIA.*

By Emil Gruening, M. D.,

New York.

The streptococcus group stands out preeminently among the various microorganisms causing purulent inflammation of the middle ear. Recent studies on the bacteriology of acute affections of the middle ear show that they are due in more than fifty per cent of the cases to the presence of streptococcus pyogenes, and in about fifteen per cent to streptococcus mucosus. Leutert, Suepfle, and E. Libman, of the pathologic laboratory of Mt. Sinai Hospital, report identical results. It seems then that the pneumococcus and the staphylococcus do not play as important a rôle in the causation of purulent middle ear disease as has formerly been assigned to them. Still, these organisms are frequently demonstrable, as are also a number of other bacteria in either pure or mixed cultures.

One of the most dreaded complications arising in the course of purulent middle ear disease, thrombosis of the lateral sinus, is most frequently associated with a general systemic infection. Blood cultures taken from patients thus infected, show that the cause of the systemic disorder is again the streptococcus which circulates freely in the blood.

In the last ten cases of thrombosis of the lateral sinus occurring in the otologic service of Mt. Sinai Hospital, the blood cultures were made under the supervision of Dr. E. Libman. The blood used in these cultures was taken from the median vein before and after ligation of the internal jugular vein. The blood culture reports of these ten cases, received from the pathologic department, are positive in seven cases, neg-

*From the New York Medical Journal, June 5, 1909, republished in the Annals by request of members of the section.

ative in three. The microorganisms causing the infection were, in five cases the streptococcus pyogenes, in one case streptococcus mucosus, in another the bacillus proteus. The same organisms had previously been found in the purulent discharge of the ear. As stated before, the internal jugular vein was ligated in all these cases. Of the ten cases here grouped together, eight patients recovered and two died. One death occurred from meningitis in a case the blood of which was reported negative, and the second death took place in the case infected by the bacillus proteus. These observations go to prove that blood taken from the veins of the arm will demonstrate the presence of the microorganisms in the general circulation more convincingly than the blood taken directly from the sinus. Leutert has advocated the latter method to indicate the presence of a thrombus. Furthermore do the clinical data prove that the presence of the streptococcus in the blood does not necessarily lead to a fatal issue, but on the contrary, provided the internal jugular is ligated, permits of a favorable prognosis.

I have selected of this group of ten cases, the last two, with positive blood findings, as examples of what the course of the disease may be under different conditions. In the first case we must assume that the formation of new foci had already begun before ligation of the jugular. In the second, the thrombosed sinus was the only focus and this was disposed of by ligation of the jugular and removal of the thrombus.

Case 1. L. H., a schoolboy, ten and a half years old, was admitted to the ear wards of Mt. Sinai Hospital on March 31, 1908.

Present Illness: Twelve days ago he began to complain of severe pain in the left ear, with headache, fever, and marked prostration. Severe pain in the left ear continued, together with high fever. For the past four days he had daily shaking chills lasting fifteen minutes and followed by marked sweating. He also vomited repeatedly during the last four or five days, and the contents of the stomach were ejected with considerable force. He was very drowsy during the last few days, and two days ago seemed delirious. Bowels moved three to four times daily, loose and watery. No convulsions. The chief complaints were: Pain in ear, headache, high fever and chills,

projectile vomiting, diarrhea, marked prostration, lethargy, and slight cough.

Physical Examination: The child remained quiet in a lethargic state, but answered questions. Lungs were clear, except for an occasional sibilant sound, especially in the left interscapular region. Slight dullness in left supraclavicular fossa. Pulse was equal, regular, small, soft, with fair force. Abdomen was slightly distended, no rigidity, no definite point of tenderness. There was no Kernig sign, no Babinsky reflex. In the right ear the drumhead was red and bulging, and the mastoid process was very tender. In the left ear the drumhead was also bulging; there was marked tenderness on pressure over the antrum, the tip, and also the postmastoid region. In the neck there was a decided distension of the left superficial veins; marked tenderness along the course of the internal jugular vein on left side.

The ophthalmoscopic examination was negative. Temperature 105.4° F., pulse 100, respiration 28. White blood corpuscles count was 11,200; polymorphonuclear count 86 per cent.

Operation: The drumheads were incised and pus was obtained from both tympanic cavities. Pus contained streptococcus pyogenes. The next day, April 1st, the operation on the left mastoid was performed in the usual manner. The antrum and mastoid cells were full of pus, the sinus plate was softened, and therefore removed. It was found that the sinus wall had sloughed, and pus was oozing from the interior of the sinus. No flow of blood from sinus. At this juncture it was deemed necessary to expose the internal jugular vein. It was found diseased in its whole course from the jugular foramen to the clavicle, and was excised. The sinus plate was then cut with long forceps until the jugular foramen was nearly reached. There was still a small bridge of bone covering the jugular bulb. This was also removed with the forceps. The jugular bulb lay before us containing a disintegrated clot. The anterior wall of the sigmoid and lateral sinus to a distance half way between the upper knee and the torcular were then removed until free hemorrhage was obtained from the peripheral end of the sinus. And now the sinus and the bulb had been converted into a groove in which the softened grey thrombi lay. All these were removed. The operation on the

bulb was done in accordance with Grunert's method. There was no difficulty in the removal of the bridge, and the transverse process of the first cervical vertebra was not in the way.

While the patient was on the table the pathologist drew blood from the median vein for the purposes of a blood culture. The report we obtained from the pathologist was that the blood contained the streptococcus pyogenes. The thrombi of the sinus and the jugular and the pus of the mastoid all contained the streptococcus.

April 2nd. Postoperative condition was rather poor. Pulse 148, respiration 38, temperature 107.2° F. An intravenous infusion was made as the temperature dropped over twelve degrees in the next four hours, from 107.2° to 95° F. The temperature remained at 95° F. several hours, then rose to 96° F., at which point it remained stationary a little while, and then rose in one straight line with a chill to 106.4° F. The blood culture made at this stage was negative, showing that the focus had been thoroughly dealt with.

April 4th. The last two days the temperature ranged between 99° and 104° F. No chills. There was a profuse discharge from the right ear and tenderness over the right mastoid. There was also a marked edema over the whole scalp. Patient was restless, vomited bilious fluid, complained of pain in the right inguinal region and right knee. The temperature rose again to 106° F., and the streptococcus reappeared in the blood. White blood corpuscles count, 20,000, polymorphonuclear count eighty-nine per cent, lymphocytes ten per cent, eosinophiles one per cent. On the same day an operation was performed on the right mastoid. The antrum and the mastoid cells contained pus. The sinus plate was removed and one inch of the sinus exposed. It was soft, blue, and appeared normal.

While the patient was on the table and under the influence of the anesthetic the wound on the left side was dressed. The wound looked clean. No purulent discharge. It was found that a disintegrated clot plugged the peripheral end of the lateral sinus. The bone over the latter was removed and the sinus wall incised. The plug was dislodged and free bleeding followed.

April 9th. In the past three days the temperatures ranged between 99° and 103° F., pulse between 80 and 100, respira-

tion 24. An abscess appeared on the outer aspect of the middle of the right thigh. It contained about three ounces of yellowish, frothy pus. Pathologic report, streptococcus. The mastoid and cervical wounds were dressed and looked well.

April 11th. Temperature ranged between 99° to 102.8° F. Over the occipital region an area about the size of a silver dollar was infected and sloughing, showing bare bone.

April 13th. There was a swelling of the right knee joint with distinct fluctuation above and below the patella. The right knee was immobilized with a starch bandage.

April 16th. In the inspection of the wound on this day it was noted that there were some granulations in the sinus grooves. Pus in both antra. The wounds were washed with hydrogen peroxide and salt solution, and sprayed with a three per cent carbolic acid solution. Dry dressing applied. The right knee joint was distended and markedly tender. Three days later, on

April 20th, Dr. Lilienthal, one of the surgeons of Mt. Sinai Hospital, aspirated the right knee, and evacuated a large amount of thick pus. He then applied a compression bandage and immobilized the knee. A few days later a large swelling appeared on the posterior aspect of both arms. They were large intramuscular abscesses from which about six ounces of pus were removed. On

May 1st the following notes were made: "There is a moderate purulent discharge from the wounds in the arms and in the right thigh. Mastoid wounds and wounds in neck are clean and granulating. Pressure sore on scalp shows granulations completely covering bone. Still some fluid in knee joint. General condition fairly good. Lungs and heart negative. Blood culture sterile." On

May 3rd when the temperature did not rise above 100° F. the patient began to complain of pain in the perineum. He continued to complain of this pain, and a large, hard, nodular mass presented itself on the left side of the perineum. On

May 9th Dr. Lilienthal was kind enough to see the patient for me, and operated upon him by incising and draining the abscess in the perineum, and also incising and draining an abscess in the suprapubic region. On

May 25th the boy was discharged from the hospital with all

his wounds closed, with good hearing, and a movable knee joint.

CASE 2. Mrs. R. R., thirty years of age, was admitted to Mt. Sinai Hospital on October 16, 1908.

Present History: Four weeks ago she had a severe cold in the head. About one week later she suffered with acute pain in the right ear, headache, and fever. This lasted about two weeks, when the ear began to discharge. The discharge was slight and the pain in the ear continued. In the past three or four days the discharge ceased, and the patient had several chills. Pain in the ear became very intense, and radiated to the parietal and occipital regions. The throat at the right side was very painful inside and out. Temperature on admission 103.4° F., respiration 30, pulse 120. White blood corpuscles count, 22,800; polynuclear, ninety-four per cent; lymphocytes, six per cent. Her chief complaints were: Pain in right ear and mastoid region, severe headache, fever and chills, pain in upper right neck, deafness of right ear, and drowsiness.

Local Physical Examination: There was a marked tenderness over the right mastoid from the antrum to the tip and over the postmastoid region. There was also decided tenderness over the upper part of the internal jugular vein. There was no redness or edema anywhere, only pain on pressure. The right auditory canal was decidedly narrowed by swelling of its walls and by sagging of the posterosuperior wall. The drum membrane was congested in its upper part and bulged outward. In its lower part there was a small opening through which pus exuded.

General Physical Examination: Patient looked very sick. There was a strong tendency toward drowsiness, patient closing the eyes and apparently sleeping as soon as she was left undisturbed. She could easily be aroused and kept awake, but when left alone soon returned to the former state. The pupils were small and equal, and reacted to light and with normal accommodation. Examinations of lungs and heart were negative. Pulses equal, rapid, of good force and quality, knee jerks active and equal, no Kernig sign, clonus, no Babinski reflexes.

Operation October 16th: Paracentesis having been performed, the usual postauricular curved incision with posterior prolongation was made. The cortex was hard, and after its

removal a number of cells were exposed filled with recent granulations. The antrum contained pus. No sinus plate could be found. The anterior wall of the sigmoid sinus was entirely destroyed, and the sinus itself filled with a black clot, in which there were white streaks. After all diseased bone had been removed and the antrum thoroughly curetted, a portion of the lateral sinus was exposed and found to be normal. The mastoid wound was now temporarily packed, and attention directed to the internal jugular vein. This was identified with some difficulty, as the lower two-thirds was grey in color and apparently collapsed. The silk ligature was placed about the vein a little above its juncture with the subclavian. In dissecting the internal jugular vein from the adjacent structures a chain of enlarged lymphatic glands was found along the posterior surface, forming a sort of bed for the vein. These were removed. The highest ligature was placed about the vein just above the point of entry of the facial branch, which was also tied off. The jugular vein was then resected. The wound in the neck was then packed with iodoform gauze.

Returning to the mastoid wound, the clots referred to as occupying the opening in the sinus walls were lifted off. With a spoon directed toward the heart a portion of the clot was removed from below, but no bleeding ensued. A second time the spoon was introduced downward, and almost immediately there was a gush of blood from below with dislodgment of a very long clot. It measured more than an inch, was black in color and had white streaks. The wound was immediately packed with iodoform gauze. The segment of a vein from the ligature above the facial branch was apparently not thrombosed, but contained fluid blood. Blood culture from the left arm taken with patient on the table.

Postoperative condition was good. Pulse 128, respiration 32. Report of blood culture showed streptococcus mucosus.

The next day another blood culture was taken, which was negative. The temperature fell to 99° F. and remained so all day. Pulse ranging from 92 to 100, respiration 24.

October 20th. Condition of the patient gradually improved. and on October 22nd, five days after the operation, fever had actually disappeared. Temperature 99° F. The wound was dressed for the first time. The mastoid wounds showed beginning granulation everywhere. They were fresh and healthy.

The patient made an uneventful recovery and was discharged from the hospital in good condition.

In the two cases here minutely related, and in the whole group of the ten cases mentioned, the diagnosis of sinus thrombosis was made from the clinical symptoms alone. The blood culture was not necessary for the corroboration of the diagnosis, but it was important to become acquainted with the relation which sinus thrombosis bears to systemic infection. This relation once established will assist us in the proper appreciation of the obscurer cases in which the clinical data are insufficient for the recognition of thrombosis of the sinus.

That a positive blood culture can be advantageously used as important evidence of the presence of a thrombus has been repeatedly demonstrated at Mt. Sinai Hospital. Patients who, after a thorough mastoid operation, did not do well, and whose temperature remained high, though the accessible part of the sinus appeared healthy, improved immediately upon ligation of the jugular, which was thought advisable as the result of a positive blood culture.

We may even go further. In two cases admitted to the medical wards with high fever, systemic infection, and no previous history as to ear trouble, Dr. Libman requested me to examine the ears and lay bare the sinus of the side of the possibly affected ear. He arrived at the diagnosis of sinus thrombosis by the exclusion of other foci in the presence of a positive blood culture. In both these cases the lateral sinus was found thrombosed, though with the exception of old perforations of the drum, there were no external evidences of ear disease. The two patients recovered after evacuation of thrombi from the lateral sinus, one with and one without ligation of the jugular.

36 East Fifty-seventh Street.

XIII.

A CASE OF RECURRENT MASTOIDITIS WITH INVOLVEMENT OF THE LABYRINTH.

By Hugh B. Blackwell, M. D.,

New York.

Previous Aural History.—Eight years ago this patient underwent a Schwartze operation for the relief of acute mastoiditis in the right mastoid region, one week later a similar operation was performed behind the left ear. After a convalescence extending over one year, both wounds healed, but for every subsequent year since then, they have each broken down and discharged, for periods of several weeks. During these attacks of recurrent mastoiditis there has never been any pain, vertigo, nausea or other subjective symptoms. In the intervals the ears have been perfectly dry.

Present Aural History.—For the week prior to December 1st, 1908, patient suffered from a severe coryza, and the left ear began to discharge posteriorly. This ceased inside of one week. In the meantime the old mastoid cicatrix on the right side broke down and commenced to discharge, together with discharge from the canal. About the same time the patient noticed that she had a right side facial paralysis, together with the fact that she became very dizzy on assuming the erect posture, associated with a tendency to fall backwards. The vertigo became so severe that the patient was compelled to go to bed and remain there for the following three weeks, during which time there was no pain or nausea. About December 21st, 1908, she was enabled to get out of bed, as the vertigo was much less severe. After remaining out of bed for one week she came to the infirmary for treatment.

Examination of the Patient on Admission to Hospital.—Patient had a moderate degree of paralysis of the right side of her face. There was no nystagmus or vertigo. Patient was whirled upon a revolving stool in both directions, ten times in ten seconds. After each whirling, a lateral nystagmus was

observed, which only lasted from 5 to 7 seconds, and was as marked in looking to the right as to the left.

Aural Examination, Right.—In the region of the right mastoid cicatrix there was a discharging sinus, which led down to the antrum, at bottom of which bare bone could be felt. Canal was filled with odorous pus, marked sagging of the posterosuperior wall almost occluded view of drum, which, however, could be seen intact, with no visible perforation. Moderate tip tenderness could be elicited.

Left Ear contained some odorous pus, with a posterior perforation of the membrana tympani, the old posterior cicatrix dry.

On January 2d, 1909, patient was admitted to the New York Eye and Ear Infirmary, service of Dr. Lewis, and four days later was operated upon; during this interval, prior to operation, her temperature remained normal.

Operation.—A semilunar incision was made in the line of the old cicatrix, and the Schwartze cavity scraped free of granulation tissue. A portion of the bony floor of the middle fossa was found to be diseased. This was removed, revealing the underlying dura, very much congested, and presenting several flakes of fibrinous deposit on the surface. The bony floor was still further removed until healthy dura was exposed. The sinus, which had been evidently exposed in the previous operation, was also uncovered. Over a small area, in the vertical limb, on its wall at that point, were several flakes of fibrinous deposit. The overlying bone was removed until healthy sinus was exposed. After removing the granulation tissue from the antrum, the entire cap of the horizontal external semicircular canal was found to be absent, and from either extremity of the canal were fistulæ leading into the internal ear. The posterior canal wall was then taken down and the tympanum scraped free of ossicles and granulation tissue. The facial nerve was then seen to be exposed for a distance of from one-eighth to one-fourth of an inch in the tympanum, and attached to its under surface at this point was a mass of dark granulation tissue. This was gently removed. There was then observed a large dehiscence in the outer vestibular wall, just beneath the anterior extremity of the horizontal semicircular canal, which included the oval window. The stapes was missing. The canal system was next exenterated by means of a

chisel and gouge, and the vestibule entered through the solid angle. The bony bridge between the oval and round windows was next broken down by a chisel placed in front of the facial nerve and the vestibule freely opened, it was found to contain a large mass of black granulation tissue, smears from which showed great numbers of streptococcus capsulatus organisms. The facial nerve now extended as an intact band devoid of any bony support, across the posterior portion of the tympanic cavity to the stylomastoid foramin. The gouge was next placed upon the promontory, and the outer wall of the lower half of the first turn of the cochlea was removed at one stroke. As the interior appeared normal, no more of its structure was removed. A meatal flap was cut and sutured back to the temporal fascia, and the operation completed in the usual fashion, save that the posterior wound was left open.

For four days after the operation the patient had a marked lateral nystagmus. It was equally pronounced in both directions. On the fifth day the nystagmus became more marked, upon looking towards the well side, but continued to diminish from this time on. The temperature ranged between 99° and 101° F. for the first ten days, and did not return to normal until fourteen days after the operation.

At the first dressing there was observed a small dark spot, on the under anterior aspect of the facial nerve, the point of the former tympanic exposure. There was some fear lest the nerve would slough through at this place. It may be that a part of its substance was lost, but most of it remained intact. During and after the first dressing, vaseline was placed in the cavity to protect the nerve as far as possible.

Since the operation the patient has not been dizzy. She refers all forks to the left ear. There is no air conduction for either forks or whispered speech, in the right ear. Whether there is bone conduction or not, it is difficult to say. I think that she probably hears the fork with the left ear. Since the operation, the nystagmus, as produced by whirling, is about the same in looking in either direction, and lasts from four to five seconds.

On syringing the recently operated ear with hot and cold water there is no nystagmus reaction in either direction. On syringing the sound, or left, ear with cold water there was observed a marked nystagmus when patient looks to the right. This is reversed when hot water is used.

Assuming that the symptoms from which the patient complained during the first three weeks of December, were the initial indications of the labyrinthine invasion, it is an interesting fact that the left or normal labyrinth had, within a period of two weeks after the destruction of the right canal system, undergone a complete functional compensation, entirely restoring the patient's equilibrium.

The performance of the operation during this quiescent period suggests the advisability of delaying any surgical procedure, in these cases, upon the internal ear, until all symptoms of acute labyrinthine disturbance have subsided. It being well known that practically all of the phenomena of acute labyrinthitis are capable of production, by either irritation or disease of the middle ear, without there existing any actual bacterial infection of the internal ear itself.

148 West 58th Street.

XIV.

SINUS THROMBOSIS, CELLULITIS OF THE FOOT AND ACUTE INFLAMMATION OF THE THYROID CARTILAGE.

By T. L. Saunders, M. D.,

New York.

The following case occurred in the service of Dr. G. Bacon, at the New York Eye and Ear Infirmary, to whom I wish to express my appreciation for allowing me to report it and for the benefit of his advice and ripe experience in solving the problem that it afforded.

The patient, a colored girl of about 21, unmarried, and an actress by occupation, was admitted to the New York Eye and Ear Infirmary, on December 10, 1908, with the diagnosis: Otitis media suppurativa chronica. Mastoiditis left. Otitis media suppurative chronica right. Temperature, 99.6°; pulse 94; respiration 20. Briefly her story was as follows:

Usual diseases of childhood. Previous history negative, save for an occasional attack of cystitis and leucorrhea. Has had running ears ever since she can remember. For the past four weeks has suffered from pain in the left ear, which has gradually grown worse, and for the past two weeks has prevented her from sleeping at night. In the last two days has vomited several times. No chills; thinks she has had some fever.

Physical Examination.—Left middle ear filled with granulation tissue; remnant of drum at upper part; profuse creamy foul discharge issuing from the auditory canal. Slight tenderness over mastoid, antrum and over top. Right ear shows some granulation tissue; drum at upper part. Very slight foul discharge. No malarial tendencies. Patient rather dull, apathetic; looks sick; tongue heavily coated. Otherwise negative. Blood count, December 11th, day after admission, white cells 7,800; polynuclears 76.6 per cent; urine, negative.

On December 12, 1908, pain, tenderness and discharge per-

sisting, the radical operation was performed. Cortex very thick and eburnated; very few cells. Sinus found encroaching on antrum, there being barely room to enter it. Antrum small. Middle ear filled with necrotic granulations; tegmen tympani and tegmen antri eroded; dura exposed, but normal. After the sinus was accidentally uncovered, an area one-quarter of an inch square, a rather free hemorrhage occurred from the region of the knee. This stopped later, after slight pressure from an iodoform gauze pad. At the time of operation it was thought that a tributary vein had been injured, but in the light of following events the author is compelled to believe that it was the sinus itself. A meatal flap was turned down and sutured; wound packed through canal and postauricular wound. Usual dressing. Patient did well afterward. Temperature, 99.4° to 100.4° until third day after operation, when temperature rose to 102°. Moderate cellulitis around postauricular wound was discovered; stitches removed and wet dressing applied. Temperature at once fell to 99.6° and then ran from 100° to 100.6°. On the sixth day after operation, temperature rose to 101.4°. On the seventh day, December 19th, it suddenly rose from 100° to 105.4°, four hours later to 106°. There was no chill, but the patient complained of slight headache, sore throat and pains in the joints. Wound dressed. Looked clean. Some tenderness over both shoulder joints, over knees and ankle joints. Physical examination otherwise negative.

Blood count: White blood cells, 9000; polynuclears, 86 per cent; no malaria found. Temperature, 106°; pulse, 128; respiration, 38. Convulsion starting in face, then arms and legs; rigidity; no loss of consciousness.

December 20th, eighth day after operation, temperature again rose to 106.3°, falling to 102°. General condition good. Sore throat more marked; difficulty in opening jaws and swallowing; profuse mucopurulent tenacious expectoration; extreme tenderness over both sides of thyroid cartilage. Tonsils and pharyngeal walls not apparently inflamed. On account of difficulty in opening jaws, a laryngeal examination could not be made. Tenderness in shoulders and knees has disappeared and has become localized in right tarsus. Some swelling.

On the following day tenderness over thyroid still marked. A large amount of tenacious mucopurulent secretion removed

from the region of the base of tongue and epiglottis, after which patient could open mouth sufficiently to permit a laryngeal examination for the first time. Uvula red and edematous; tonsils red; epiglottis fiery red and edematous; vocal cords could not be seen owing to general congestion and swelling. A smear of the mucopus from the throat showed spirillum of Vincent, streptococci and staphylococci. Patient's general condition very good.

On December 22d, tenth day after first operation, the patient for the first time felt chilly, and the temperature rose to 105°. As the throat condition and swelling in the foot seemed better, it was decided to explore the sinus.

Blood count: White blood cells, 30,000; polynuclears, 74.4 per cent.

Second Operation (Dr. Bacon in consultation).—Primary wound enlarged by posterior incision. Cortex over sinus removed with chisel and rongeur for about one and one-half inches. Sinus wall apparently normal, no pulsation seen, no clot felt. Opened with knife, firm clot present. Slight flow obtained from bulb and after curettage. A shining black clot two inches long extracted from torcular end, followed by free flow of blood. On account of joint symptoms persisting, it was decided to excise jugular vein. Vein excised from clavicle to facial. Vein evidently normal, not collapsed. No enlarged glands in neck. Wound drained and partially sutured. Patient left table in considerable shock. Temperature fell next day to 100.8°, rising again to 103°, and from then on, 101 to 103, occasionally rising to 104.4°. Pain in tarsus continues, swelling more marked. Mastoid and jugular wounds doing well. Patient beginning to look septic, but does not run pyemic temperature. No chills, no sweats. Physical examination, negative.

On December 30th, eight days after second operation: White blood cells, 25,000; polynuclears, 82.2 per cent.

On January 2d, ten days after second operation, swelling and tenderness marked over dorsum of right foot. X-ray, negative. Exploratory aspiration, negative. Blood culture taken, negative. From this time on, patient's general condition began to improve, but foot became worse. Operation advised, but refused by patient finally.

On January 10, under chloroform, three incisions were made

over dorsum of foot; evacuation, about a cupful of dirty brown pus and necrotic material. Tendons exposed, but not invaded. Pus found to contain streptococci in long chains. About this time the patient complained of a vaginal discharge. This was also found to contain the spirillum of Vincent in large numbers.

The interesting points in the case are these: Throat symptoms obscuring diagnosis. Sinus thrombosis manifesting itself clinically at least seventh day after operation. Inflammatory focus in foot appearing one day after sudden rise in temperature. Nature of process: Embolic more than septic. Negative blood culture.

XV.

THE AFTER-TREATMENT OF OPERATED ACCESSORY NASAL CAVITIES.*

(FROM THE ROYAL UNIVERSITY POLIKLINIK FOR EAR, NOSE, AND THROAT DISEASES. BONN, GERMANY. DIRECTOR, GEH. MED.-RAT. PROF. DR. WALB.)

By Henry Horn, M. D.,

San Francisco.

The territory covered by the title of this paper is so great that only a small portion of it will be selected for discussion. The pith of the entire subject is contained in the answer to the following question: Why does the after-treatment of the Killian operation cover a period of several weeks, when in a radically operated, isolated empyema of the frontal sinus or the antrum of Highmore, practically no after-treatment is required?

The answer is simple. In the case of the isolated empyema, the collection of pus, with its accompanying pyogenic membrane, can be radically and entirely removed, and, while a natural and at the same time sufficient drainage is always present, the cure is a permanent one.

Since Reichel in 1907, at a meeting of the German Otological Society,[1] reported a series of 60 Killian operations, there has not been published any other work in which important changes in the operation or after-treatment have been suggested.

One cannot tell with certainty what the immediate future holds, but from our standpoint of today, it is difficult to see how the principles which underlie the Killian operation can be changed. An improvement in certain details is possible. If, for example, one could suggest how the anterior wall of

*Paper read at the annual meeting of the German Laryngological Association, held in Freiburg, June, 1909. Translated by the author.

the frontal sinus could be retained, without sacrificing any of the present successful results or the gradually increasing freedom from recurrences, we might, on purely cosmetic grounds, adopt the suggestion. It is in this very connection that I wish to offer a hint, the usefulness of which you must prove for yourselves. If by any means one could secure an absolutely satisfactory drainage from the beginning of the after-treatment until a complete cure is reached, we could allow the anterior wall to remain. This drainage can be secured by negative pressure!

From a technical standpoint, the retention of the anterior wall offers no difficulties. If by means of a Roentgen photograph we find the sinus small and uncomplicated, a radical curettage from beneath the bridge or a Ritter's operation,[2] is easily carried out. If, however, a large sinus is present, then any one of the well-known osteoplastic methods can be used. It is, however, not my intention to suggest any improvements in the operation itself, but only to enunciate a principle whereby the length of the after-treatment can be decidedly shortened.

The following conclusions are based on the results of 24 radical operations on the frontal sinus and ethmoid labyrinth, all of which, except for unimportant modifications of my own, were carried out according to the method of Killian. The very short time limit does not admit of detailed case histories, and they will be later published in full. Briefly stated, then, in 11 cases, 10 to 14 days were necessary for a complete cure; in 6 cases, only 5 to 8 days; in 3 cases, the after-treatment covered a period of 3 weeks, and in the remaining 4 cases a much longer time was required. The reasons for this delay in the healing will be discussed later, and here it is only necessary to remark that it did not in any way depend on the method used in the after-treatment.

As far as I know, I have for the first time, in this series of cases, employed the principle of negative pressure as a means of securing permanent drainage from the time of the removal of the drainage material to the completion of the cure. As "completely cured," only those cases were considered, in which, during a period of six months to one year following the operation, the headaches did not return, where by inspection no pus was to be seen, or with a suction pressure

of 16 to 18 centimeters of mercury, no pus could be demonstrated as coming from the operated areas.

No one, I think, can disagree with the statement that the best results are to be expected from the Killian operation:

1. When by means of preliminary operative measures, all polyps, bullæ, easily accessible anterior ethmoid cells and enlarged middle turbinate are removed, and diseased conditions of the antrum of Highmore and the sphenoid sinus are cured.

2. When the operation is carried out in an absolutely radical manner so that not a single diseased ethmoid cell or a square millimeter of thickened frontal sinus mucous membrane remains behind.

3. When by repeated daily suction treatments, with proper pressure, the operated territory is kept free from secretion from the beginning of the after-treatment to the end of the cure.

If these prerequisites are carried out, we can confidently expect a cure inside of 14 days.

It is, however, perhaps advisable that the patient, as after a radical mastoid operation, be kept constantly under control, and where possible a re-examination be made every few months. In this way the beginning of trouble can be discovered and small granulations can be removed. In many cases, on account of an acute cold, the drainage becomes suspended and must be renewed. I am also convinced, and the opinion is shared by others, that the carrying out of this artificial drainage by suction has a distinct retarding effect on the tendency of the drainage opening to close. Exactly as is the case after a sphenoid sinus operation, the drainage opening has a tendency to close concentrically and build at the lowest point a connective tissue barrier over which the flow of secretions is hindered.

Even in cases treated by this method, where there is no trace of granulations in the region of the drainage openings, the natural position is so unfavorable that an acute cold with retention of the secretion can bring about a relapse. My first case, for example, a pansinusitis combined with ozena, was discharged healed at the end of 57 days. The outlook for a lasting result was, on account of the ozena, very poor. I heard that three months later, as a result of an acute cold, a relapse occurred, which necessitated repeated operations on the frontal sinus and ethmoid labyrinth!

If, after daily treatment for from two to three weeks, we are able with suction to demonstrate only a few drops of pus, which can be proved not to have its origin in the mucous membrane of the nose, then a second operation is not to be avoided, and one will without question find the cause in some overlooked diseased ethmoid cell. Diseased structures not removed at the operation can never be cured by suction treatment.

In a former paper, "Ueber Saugbehandlung bei Erkrankungen der Nebenhöhlen der Nase,"[3] was reported not only the beginning of my experiments in the after-treatment of the Killian operation, then only six cases, but also the value of the method of measured negative pressure in diseases of the accessory cavities in general and its value as a diagnostic and therapeutic agent.

It seems unnecessary to remark that when by means of the Killian operation, the disease of the accessory cavities is cured, this does not necessarily imply that the accompanying disease of the nasal mucous membrane will be cured as well. In order, however, to make this point clear, I will again repeat, that if the three preliminary requirements for a successful operation have been fulfilled; if the operation has been radically and properly performed; if the after-treatment has been properly carried out, and we then still have secretion, the cause for the trouble lies not in the operation or the after-treatment, but in some secretory disturbance of the nasal mucous membrane itself.

And just here are we in a position, by means of the method about to be described, to at any time determine, whether any given case is really cured or not, and whether the secretion arises from the operated accessory cavities, the unoperated accessory cavities, or the nasal mucous membrane itself.

Our failures are always found in those cases where an accessory cavity disease is combined with an ozena. In spite of a properly carried out operation, the after-treatment drags along from week to week, the nose secretes daily a large amount of mucus, which is usually found on the floor of the nose, and the exact origin of which is hard to determine. The method of determining the source of the trouble is as follows:

1. By means of an irrigation, the antrum is shown to be free from secretion.

2. The drainage openings of the sphenoid sinus and the operated territory are firmly tamponed with small pledgets of cotton.

3. A thin layer of aristol is blown over the nasal mucous membrane.

At intervals of a few hours the nose is now carefully examined. If a secretory mucous membrane disease is the cause of the trouble, the aristol will be seen raised on a thin layer of mucus. If now no mucus is seen, and, after removing the cotton plug from the operated territory but not from the sphenoid opening, suction shows a collection of mucus pus, then the newly formed lining of the operated territory is at fault, or some hidden diseased area was left behind at the time of the operation.

Before I turn to a consideration of the method of using negative pressure as an assistance in the after-treatment of operated accessory cavities, I wish to call attention to the apparatus itself. As you see by Figure 1, the nose suction apparatus consists of three parts, the nose piece, the pump, and the manometer for determining the amount of negative pressure used.

The nose piece[4] (Fig. 2) is entirely of glass, and is easily cleaned and sterilized. The part which closes the nostril has the shape of an olive and thus fits every nose. At the air outlet you see a small glass tube projecting into the interior, which prevents all secretion from entering into the rubber tube and thus the pump. The nose piece is roomy and rests on a flat bottom, thus allowing it to be conveniently placed to one side for purposes of comparison or examination.

It is not necessary to enter into a detailed description of the manometer, except to call attention to the protection chamber on the right, which is connected with the same by a movable glass joint, and held in place by two springs. This protection chamber is for various reasons of considerable importance, especially if one is using a water-jet pump, for when the water is suddenly turned off, the water backs up and would otherwise overflow the manometer.

In the mercury chamber you see a tiny air intake, so arranged as to prevent the quicksilver from being blown out, as was formerly the case in my first models, when one was using a rubber ball or poorly constructed pump.

Any method, except the uncertain rubber ball, can be used for the suction. The ordinary Bier's metal suction pump is perhaps the handiest and always to be depended upon. Since Strauss and later Martens recommended the ordinary laboratory water-jet pump for use in this connection, I have tried it and found it very satisfactory. Especially can such a pump be used in hospital and clinical work, where many patients are to be treated. It has an additional advantage in that the patient can carry out the treatment without the presence of the physician.

The method of using the apparatus is extremely simple. The olive end of the nose-piece is placed lightly but firmly into the nostril, care being taken that the opening is not closed by the mucous membrane of the septum or the inferior turbinate. The wing of the other nostril is held closed with the finger, as is shown in Figure 3. The patient now sings a loud, continuous "eeeeeeeeeeeeeeeeeeee," by means of which the soft palate is raised and the nose, together with the nasopharynx, becomes a closed cavity. At the same time, the pump is quickly brought into action, care being taken with a new patient not to exceed 4 to 5 centimeters' pressure or prolong the suction for more than 10 to 15 seconds. In the following treatments the pressure can be gradually raised, but never high enough to become disagreeable to the patient.

The exact method which I used in the after-treatment of my Killian operations was as follows: On the third day the gauze strip or rubber drain was removed. On the fourth or fifth day, depending on conditions, one commences very carefully with the suction. One uses a pressure at the first treatment of 6 to 8 centimeters for a period of 15 to 25 seconds. If mucopus and no blood appears, one can increase the pressure on the following day to 12 centimeters. Higher than 18 centimeters is never necessary. Usually the secretion is at its height on the fifth to sixth day, and then rapidly diminishes, so that in favorable cases, on the eighth day the nose is entirely dry.

In closing, I wish to again repeat the conclusions which the experiments and operative work have allowed me to make:

1. By means of negative pressure, the duration of the after-treatment of the Killian and other operations on the ethmoid labyrinth is undoubtedly shortened.

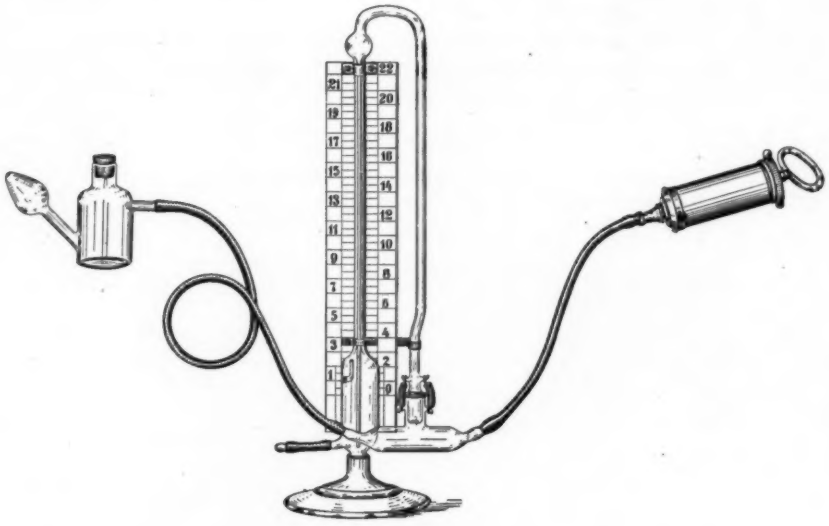


FIGURE 1

FIGURE 2.

2. By this method we can at any time determine whether a case is really cured or not.

3. The artificial drainage of the accessory cavities, by means of negative pressure, is, according to my experience, a distinct advantage in the after-treatment of this class of cases.

203 Post Street.

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FIGURE 3.

XVI.

LATEST ADVANCES IN THE STUDY OF TINNITUS AURIUM.*

By D. Bryson Delavan, M. D.,

New York.

Amid the din of the battle against suppurative diseases of the ear the voice of tinnitus aurium seems to have been almost lost. The recent attempt of the Section in Laryngology of the British Medical Association to revive an interest in this most important subject is, to say the least, praiseworthy. It has seemed desirable that your attention should be called to it, and to that end I ask the privilege of offering a brief report of what was said.

The discussion held in Belfast upon the 27th of July, 1909, was opened by Dr. Thomas Barr, of Glasgow, and by Mr. Richard Lake, of London, Dr. Barr's paper dealing solely with the non-operative treatment of tinnitus, while Mr. Lake considered the operative measures applicable to some of the conditions which might be its cause. It is needless to say that the paper of Dr. Barr was a masterly review of the subject, with special reference to methods of treatment in vogue at the present time.

He assumed at the outset that tinnitus aurium was merely a symptom, the effective treatment of which must depend on a correct knowledge of the conditions underlying it. Hence, thorough examination of the organ of hearing by all the subjective and objective methods is a primary essential.

Since tinnitus might be due to a variety of causes, some of them located in the middle ear, some in the external ear, and some outside of either, it was necessary that a careful examination should be made in every direction in which a cause might possibly be found. Thus, disturbances of digestion, abnormal conditions of the heart and of the circulation and of other organs are sometimes the real etiologic factors. The influence of anemia must also be recognized, while neurasthenic conditions might be either a cause or an effect.

* Read before the Section in Otology, New York Academy of Medicine, November 12, 1909.

After brief reference to cases dependent on accumulation of wax, eustachian obstruction, removable fluids in the tympanum and other conditions in which tinnitus could be readily cured or relieved by well-known methods, the author passed to the consideration of those cases where tinnitus persists after ordinary methods of treatment have been exhausted, or where no definite lesion can be shown by objective examination to exist in the ear. In this connection, he emphasized the importance of attention to the general health and the influence of coexisting disease, as also that of mental attitude, personal habits and climate. He then discussed external applications, largely in accordance with the methods described in his well-known hand book and familiar to you all.

In tinnitus associated with otosclerosis, or with new formation of connective tissue in the tympanic cavity, or with auditory nerve involvement, whether intralabyrinthial or intracranial, the prognosis is unfavorable, and the treatment should be general rather than local. With regard to the administration of drugs, thyosinamine had sometimes been found helpful, but not uniformly so. The administration of phosphorus had not been tried in England, but from what could be learned of the effects of its use by others, Dr. Barr did not consider that its results were promising. Quinin and hydriodic acid were not recommended, while the salicylate of soda was of doubtful benefit. Alcohol, unless in very small quantities, was, of course, contraindicated. He had found distinct advantage from the use of bromid of ammonium, or of hydrobromic acid, combined with strychnin and arsenic. The iodid of potassium had been thought by some to check the early progress of otosclerosis, while pilocarpine was of distinct value in suitable cases of labyrinthine disturbance. Electrical treatment has proved ineffective and seemed to have been abandoned. The use of vesication, if applied early, occasionally gave good results. Vibration was also sometimes helpful, but the effect was bad if it called the patient's attention unduly to the ear. With regard to pneumatic massage, its value had not been proved, while the noise of the machine was a distinct objection. The tuning-fork treatment had not proved of lasting benefit.

In the discussion which followed the paper of Dr. Barr, Dr. Knowles Renshaw referred to the value of thyosinamine and

recommended that it be administered in 10% solution of water with 20% of glycerine and in doses of from 5 to 30 minims. The existence of arteriosclerosis was a contraindication for the use of this drug. He suggested the danger of the use of fibrolysin in cases of old ulcer of the stomach.

Dr. Logan Turner, of Glasgow, spoke favorably of injections of fibrolysin made directly into the labyrinth.

Dr. Andrew Wyllie advocated the method of treatment by which hot air was injected through the eustachian tube at a temperature of 120 Fahrenheit, and he presented an apparatus for the purpose. It was suggested that Lermoyez had reported that the hot-air treatment was not as popular with him now as formerly.

Dr. Ward Cousins called attention to the evil of overpolitzerization. He believed gentle chloroform inflations good in some cases.

The treatment of tinnitus aurium by operative measures was considered by Mr. Richard Lake, of London, in an able and very interesting paper. He referred first to what might be called remote operative measures, in the form of intranasal treatment, lumbar puncture, and ligation of the carotid artery. He afterwards traced the gradual evolution of the course of operative interference from simple removal of one or more of the ossicles or of removal or separation of adhesions, and the like, and the opening of the perforation of the labyrinth, to the complete ablation of the latter and to division of the auditory nerve. He believed that any fixation of the stapes contraindicated operative interference and that removal of the ossicles was the best and the safest operation. He dwelt upon the subject of lumbar puncture at some length and stated that in the light of his knowledge and experience in the use of this particular operation, it was one of too serious a nature to be recklessly considered and recommended. The question of division of the auditory nerve was also presented and discussed by him with much care. He had collected the histories of eight cases upon which this operation had been performed. Of these, four died, apparently as a consequence of the operation, two succeeded and two failed.

In the discussion of this paper, Dr. Ward Cousins expressed the belief that in cases of tinnitus which were not amenable to

other forms of treatment, operative work would be our future hope, and this would include division of the auditory nerve.

Dr. Delavan referred to the work of Sexton and of Orne Green in the United States and expressed regret that it had not met with wider appreciation.

In summing up the discussion, Dr. Barr called attention to the fact that it had been impossible under existing circumstances to bring forward more than a resumé of knowledge already known, and he ended with the significant and distressing statement that, as a matter of fact, no substantial advance had been made with regard to the treatment of tinnitus aurium in the last twenty-five years.

Were any apology needed for my appearance here this evening, the above assertion, coming from the source that it did, would amply justify my effort to stimulate the interest of the profession in one of the most disastrous afflictions that can befall mankind.

SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Regular Meeting, February 12, 1909.

DR. ROBT. LEWIS, JR., CHAIRMAN.

Case of Cerebellar Abscess.

DR. J. D. RICHARDS. A report of this case was given at the Eastern Section of the Laryngological, Rhinological and Otological Society, two years ago, in Providence, so I will simply cite the earlier features and call attention to a few points in the case which were not dwelt upon at that time. The history was that of an ordinary chronic suppuration from the middle ear, for which a radical operation was done. Three weeks intervened, and then intracranial symptoms for the first time developed. He had vomiting, dizziness, severe headache, no optic neuritis, pulse 50, temperature subnormal, 97.5°. He was then reoperated upon, and an epidural abscess was evacuated. The temporosphenoidal lobe was explored, with negative results. After this, the patient improved for two days, when papillitis developed, with a train of symptoms which pointed to complications in the cerebellar lobe—marked drowsiness, irritability, inaccurate answers, and there was intense headache over the entire left head, chiefly frontal. The temperature rose to 102.6°; pulse from 72 to 140 per minute; both pupils were dilated; there was double optic neuritis, and marked nystagmus—oscillations most marked when turned from the involved side, and also marked when turned to the involved side; the palate of the left half was paralyzed so that the uvula was directed to the right. There was complete facial paralysis, but this came on seven days subsequent to the original radical operation. The patellar reflex on the left side was absent, and on the right side was diminished, but present, and both biceps and ankle jerk were observed on the right side. Plantar flexion on the right; no clonic or neuro-tactile spasms. No aphasia, no anesthesia, and position sense was good. There was no coordination. When he attempted to touch anything with the left forefinger his hand would pursue a deviating

course and touch anywhere. When attempting to touch with the right forefinger the disturbance was not so marked. There was no pain on percussing the skull. These were the conditions which led to the diagnosis of cerebellar condition, and appeared subsequently to the operation on the temporosphenoidal lobe, which had been done a few days before, so that there was a better basis when the cerebellar condition was operated for than had existed previously. The abscess was found by making an incision through the dura, corresponding to the posterior antral wall. The abscess was half an inch below the surface, and a considerable quantity of thin fetid pus was evacuated. A second incision was made, an inch and a half behind, vertically, and the two tracts met. Upon the evacuation of the cavity, the pulse was decidedly accelerated, but the respirations were not noticeably diminished or increased. On the day following, there was a marked diminution in the size of both pupils, and a marked improvement in both coordination and general appearance. The further history of the case is not of special interest.

The points which were not referred to in this report and which I hope will bring out some discussion are, first, the headache. It was intense, confined to the left half of the head, and more particularly to the frontal region. The association of the frontal headache with cerebellar abscess is more than a coincidence. It is too common, and instead of misleading us, it points more to that than otherwise—not that it is characteristic of it, but the association is very common. The second point in reference to the headache was that it was very violent. In the cases of cerebellar abscess that I have seen personally, the headache is more violent than in abscess of the temporosphenoidal lobe. It is more excruciating, and when we remember that headache and optic neuritis are common effects of pressure, it agrees with the fact that the papillitis first attained its greatest perfection, and then the cerebellar abscess and headache attained their greatest degree of intensity.

Next, the choked disk. On August 3d there was no choked disk, on the 5th there was definite papillitis. That shows that the eyes should be examined every day when intracranial involvement is suspected. I had one case in which one day there was no optic neuritis, and in twenty-four hours it was very definite.

Another point is that subsequently the patient developed a

considerable degree of neuritis distributed over the temporal half of the fundus, and one of the surgeons said that he could find no trace whatever of any previous pathologic condition. The diminution in vision in this case was not proportionate to the pathologic appearance of the fundus. We see cases with 5, 6, or 7 diopters of choking, and yet when the vision clears up, the diminution is not proportioned to the pathologic changes seen.

Next, the nystagmus was marked, and was seen in both extreme lateral positions, also the upper median, and was most marked towards the healthy side. The same condition is still present—not marked, but it can be seen when the patient looks to the extreme right and left lateral positions. It is claimed by some that the nystagmus of cerebellar abscess is characteristic. That is not true. Nystagmus in these cases cannot be differentiated from that due to labyrinthine disease, and even if, as claimed by some, the nystagmus is greater when directed to the side of the lesion, it does not serve to differentiate it. You can see a definite nystagmus when this patient looks in either direction.

Then the facial paralysis which came on seven days subsequent to the primary operation. At the time of the operation it was not present. We are inclined to look upon these postoperative paralyses lightly, but this one has not cleared up. That shows we may get a comparatively permanent facial paralysis, even when the nerve is not injured.

The fifth point is the choice of anesthetic. I am against the giving of ether in cases where there is increase of intracranial tension. If we examine the brain of an alcoholic who has died from a debauch, we see the condition of the cerebellar structure, and when we give ether, it puts him on the same path—it gives too much congestion. I have seen two cases of cerebellar abscess where ether was given, in which suspension of respiration occurred—one complete suspension of respiration, and in the other a tracheotomy was done in order to facilitate artificial respiration. When there is a hole in the skull we might feel that the giving of ether might not produce intracranial tension. It is not the intracranial tension, but it is the edema of the tissues of the brain, I think, which causes the suspension of respiration, and the hole does not lessen that.

Next, with reference to the instruments used for explora-

tory purposes. The knives we use might be improved. They are better than a grooved director, but I had one case of meningitis in which there was some question as to whether cerebellar involvement had taken place, and as the patient was practically beyond hope, it was decided to find out whether we had overlooked that, and three punctures were made into the left cerebellar lobe, and the patient succumbed very quickly, and with quite a rise of temperature, just as is seen in pontine hemorrhage. It seemed probable that I had been the responsible immediate cause of the patient's death. We can have a knife that is not necessarily so sharp, and not use that one to cut the dura with, but use a separate knife for that. If a brain is put under a spigot and the white and gray matter washed out, it is difficult to see how we can explore it without cutting the vessels, yet we rarely see a hemorrhage following the track of the knife.

The area occupied by these abscesses constituted one-half of the left cerebellar lateral lobe, and it was two inches from the surface of the dura to the inner wall of the abscess cavity. Recovery from cerebellar abscess is very infrequent; temporosphenoidal abscesses give much better statistics.

There are several points in connection with the use of the encephaloscope which illustrate some of the disadvantages of that instrument. The location of the abscess was such that the encephaloscope could not be used. If we attempted to insert it through the opening in the dura, just back of the posterior antral wall, it could not be done; and if we attempted to insert it through an opening in the dura at that point, we were bound to force the axis of the instrument too far inward. You have to make an opening in the lateral aspect, and so follow the track of invasion; if you do not do that, you have to make an incision through a portion of the brain which is not infected at all. A second point in this connection was that when the encephaloscope was introduced through the lateral opening, pus veiled the obturator, and the instrument was withdrawn and again introduced. When part of the pus cavity is evacuated, we feel that it makes room for the introduction of the instrument again, but that is not correct, because the consistency of the brain is such that when a portion is evacuated it closes down upon the remainder, and when you introduce the obturator you have the same pressure that you had before. When the instrument was finally passed into the

depth of the cavity there was a rush of pus through the anterior opening which could not get through the encephaloscope. That shows the danger of using the encephaloscope where you have but one opening into a cavity, and particularly the temporosphenoidal lobe. A third point in connection with the encephaloscope is that after the abscess is evacuated a number of veins could be seen running across the cavity itself. On taking a bayonet forceps and grasping some of these veins, I could tell from the tension that if I attempted to go through that with the instrument the thin walls of the cavity would be torn. The introduction of the encephaloscope under these conditions is certainly a danger.

The last point in connection with this case is the complete recovery of the patient's equilibrium, which did not take long. He is now a worker upon high buildings and suffers no disturbance of coordination, and the only sign remaining is the nystagmus—a very fine nystagmus is still noticeable in the right or left lateral position.

DISCUSSION.

DR. KENEFICK asked if Dr. Richards had fore and aft drainage, and what was the drainage material.

DR. RICHARDS replied in the affirmative. An incision was made in the dura corresponding to the posterior antral wall, an incision leading directly backward from the front of the cerebellum; and then a second one, a half inch behind the middle of the sinus lobe—a second incision leading from that inward, or from before back—practically at right angles. Perforated bone tubes were the instruments of drainage.

DR. KENEFICK asked if Dr. Richards meant perforated bone tubes, and, upon being answered in the affirmative, said that if such results were obtained with them it was certainly very satisfactory. He then asked if they came to the surface of the wound, and if there was any gauze inside of them.

DR. RICHARDS replied that the tubes were perfectly stiff, came to the surface of the dura, and had nothing inside—they were practically chicken-bone tubes. They were obtained from a firm in the city, but he had shortened them to suit the length of the tract.

DR. KENEFICK said that this opened up a new method of drainage. Much has been said recently by those who have reported cases advocating the use of some soft substance as the

best drain for these abscess cavities, but it would seem, after all, that success can be obtained with a stiff bone tube, and it is worth while trying to insert it into the cavity of the abscess without injuring the brain tissue.

Dr. Richards answered in the affirmative, in reply to a query as to whether the tubes were gradually shortened. The anterior tract was the most inaccessible, and the anterior tube was the shorter, for in order to get it through the tract, the same difficulties existed that interfered with the use of the encephaloscope, and a short instrument or a short tube is required, for the canal interferes, the soft tissues interfere. The anterior opening when the pus became lessened was allowed to close first, and the anterior tube was gradually shortened, and when it was completely taken out, the increased discharge was watched for through the posterior opening, and, finding none, it was taken for granted that no pocket had been overlooked.

Replying to Dr. Kenefick's inquiry about having the advantage of gravity in drainage, Dr. Richards said that he had the advantage of two openings; just as in any abscess, anywhere, it will drain better with two openings than with one. There was nothing new in using perforated bone tubes—that was the proceeding originally advocated by McEwen.

Dr. Kenefick said that he understood it was not much used in this country.

Dr. Richards said that he knew nothing about that.

Dr. Rae said that the question of drainage was a very interesting one, and inquired if Dr. Richards had considered decalcified bone.

Dr. Richards replied in the affirmative and said that it was practically like rubber. The question of drainage in brain abscesses presents the greatest difficulty. He has had much trouble with rubber tubes, and has tried repeatedly to get decalcified chicken bone, but had never succeeded yet. McEwen used originally decalcified chicken bone.

Dr. Kenefick inquired about the size of the cavity, and the amount of discharge.

Dr. Richards said that a considerable quantity of pus was discharged, but he could not state the exact amount. The cavity occupied practically the anterior half of the left lateral lobe. As he introduced the probe through the posterior opening later, he could detect that the posterior extremity of the cavity was behind the external opening.

DR. COBURN said that from the point of view of the ophthalmologist the choked disk was the interesting feature. Dr. Richards had spoken of the damage to the sight in these cases. That does not so much depend upon the amount of the swelling as upon the length of time that the swelling continues. Decompression operations benefit the sight only when they are performed early. When they are performed late the secondary changes are so grave that the nerve tissue is destroyed. In these cases there is frequently found apparently good vision, even during the height of the choked disk, and then marked diminution after the swelling has gone down. The vision may be normal in the early part of the attack, and later may be diminished, because of the compression of the nerve fibers by the swollen tissues; even when the patient recovers and the swelling subsides, vision is temporarily restored, but is again diminished by contraction of the new-formed connective tissue. This visual impairment is permanent. In acute cases the choked disk is of comparatively little consequence, except for diagnosis, for these cases are operated early, but where there are chronic abscesses of the brain which are not evacuated, the optic atrophy is apt to cause serious loss of sight.

DR. LEWIS said that he had not had much experience with cerebellar cases, but in one case the headache was very intense and was referred to the forehead. We get these intense headaches in temporosphenoidal abscesses also, especially where the frontal lobe is involved. He recalled two cases in which the headaches were particularly intense. The abscesses were in the anterior portion of the temporosphenoidal lobes.

DR. KENEFICK inquired if Dr. Richards' patient had any seizures before his attack—epileptic seizures, etc.

DR. RICHARDS said he thought not.

Case of Recurrent Mastoiditis With Involvement of the Labyrinth.*

BY H. P. BLACKWELL, M. D.

DISCUSSION.

DR. RICHARDS said that he saw Dr. Blackwell operate upon this case, and one feature was the one he had just spoken of —the nystagmus just before the operation was the same at one side as on the other. This is the same, as we have just seen, in cerebellar abscesses. There was no hearing prior to

* See page 155.

operation, for a mass of granulation tissue was taken out. If she did hear, it would be interesting to know how she did with a distinct mass of black granulation occupying the major portion of the vestibular cavity. There was a large dehiscence in the external vestibular wall just above the oval window, and the facial nerve stretched across the cavity like a wire over an open space. If she is correct in what she heard before this operation, it is interesting to know how she did so, particularly a whisper. Dr. Richards said that he did not believe the facial paralysis in this case would ever completely clear up, though it might decrease to a point where it would not be very noticeable, but he had never seen a case where the nerve was completely exposed which cleared up entirely.

Dr. Blackwell said that he did not test the hearing with a fork before the operation, as the patient was in the clinic and he had no opportunity to do so. He had failed to mention that she refers all forks now to the good ear. The granulation tissue was clinging to the nerve itself and was in intimate association with the nerve, and it was at that point that subsequently the darkened necrotic spot appeared.

Sinus Thrombosis; Cellulitis of the Foot; and Acute Inflammation of the Thyroid Cartilage.*

By T. L. Saunders, M. D.

DISCUSSION.

Dr. Kenefick asked what was the temperature of the patient when on the table for the original operation.

Dr. Saunders replied that the temperature was about 99°, but the operation was done on account of the discharge, the intense pain and the persistent mastoid tenderness.

Dr. Richards inquired whether the sinus operation was done at the same time as the ligation of the jugular.

Dr. Saunders replied that the sinus operation was done first and the ligation of the jugular immediately afterward. The first operation took half an hour, and the jugular twenty-five minutes.

Dr. Seymour Oppenheimer asked if there was blood culture taken prior to the sinus operation.

Dr. Saunders replied no. A blood culture was taken about ten days after the sinus operation because of the condition of

* See page 159.

sepsis. It was a question whether or not the condition of the foot was a pyemic manifestation. At that time the blood culture was negative and the streptococcus cellulitis could not be accounted for other than that it was a pyemic manifestation.

Dr. Oppenheimer said that the cellulitis of the foot was accounted for by its being a metastatic process, and as such one would not find bacteria in the blood, for they would have been shut off by the ligation of the jugular. It would be interesting to know the condition of the blood prior to the operation. The value of this is shown in a recent case. A little boy who had been operated upon for an acute mastoid developed a sinus thrombosis. The blood culture taken at that time was negative, but the clinical evidence of sinus thrombosis was so positive that the sinus operation was performed. Great difficulty was experienced in removing the clot from the bulbar end of the sinus. Blood culture taken on the operating table proved positive, although the day previous the culture was negative. That was due to the fact that in manipulating the jugular some of the infected material was set free and swept into the circulation. Much difficulty was experienced in removing the clot from the bulbar end, and although free bleeding was finally obtained, blood culture taken a day later proved positive again, with general symptoms of pyemia. It was then determined that there was probably a clot still present in the bulbar end of the sinus, and the patient was again put upon the operating table and the jugular bulb exposed, and a thrombosis was found. A subsequent culture, taken twelve hours later, gave a negative result. This winter he had seen three cases of sinus thrombosis with jugular involvement, with decided throat symptoms, though not to the degree shown in this patient. In one case there was an acute tonsillitis coincident with the sinus involvement, in which operation was deferred, with the idea that the symptoms might be due to the acute tonsillitis; but subsequent operation showed that the sinus condition antedated the acute tonsillitis. The throat symptoms were so marked that the question has arisen as to whether or not these throat symptoms are not part of the symptomotology of infective sinus thrombosis.

Dr. Richards said that in the case presented by Dr. Saunders, as well as the one referred to by Dr. Oppenheimer, the sequence of events was fairly clear. Coincident with the rise

of temperature there was evidence of metastasis, and he thought the jugular operation should have been done earlier in both cases. There were four intermissions in Dr. Saunders' case, if he remembered the chart correctly, between the initial rise and the time of operation, during which intervals there were symptoms of metastases. The case mentioned by Dr. Oppenheimer illustrates the fact that when you get a sinus thrombosis extending into the bulb the jugular ought to be ligated when you operate—you must not wait, or you will lose your patient. There may be a portion of the bulb below occluded, and there may be a hemorrhage from that source, and it is a bad error to attempt to curette the clot before excising the jugular. The subsequent history illustrates that very plainly, and the evidence for quick operation was plain. One cannot act too quickly in such cases.

Dr. Rae said that he had seen a sinus-jugular case within the last few weeks. The patient had had acute follicular tonsillitis and two acute purulent inflammations of both ears. Both drums were incised. Four days later the family physician called Dr. Rae up on the 'phone to say that the ears were much better, but the patient had rheumatism. Dr. Rae said that, of course, he immediately suspected that the rheumatism was pyemic, and had the case taken to the hospital and operated without waiting. A blood culture was taken before operation, but he did not wait for the report. There was streptococcus in the blood, but the patient recovered. The clot in the sinus extended into the bulb. The first evidence of metastasis should make us operate in all these cases, and he agreed with Dr. Richards about curetting into the bulb.

Dr. Saunders said that if had another one of these cases he would certainly go into the sinus more quickly, but this one was one of those doubtful cases, in which the throat symptoms were so marked, and in which there was nothing else to indicate the sinus other than high temperature; and he had seen a peritonsillar abscess cause a temperature of 105° and come down, but in the light of this experience he would in future act more quickly. The case had been a very valuable one to him on this account.

A Case of Ulceration of the Sigmoid Sinus With Spontaneous Hemorrhage.

Dr. Robert J. Lewis said that this young man was seen for the first time on the 8th of December. He then had a very

profuse purulent discharge from the ear and all the classical symptoms of acute mastoiditis. The operation revealed a considerable erosion of the inner plate. The sinus was exposed from below the knee to about 2 mm. of the bulb; the sinus was healthy. The patient left the hospital a week later, on the 15th of December. On the 21st of December, during a hard defecation, he felt that the bandage was moist, and on putting his hand to his head he found it (his hand) covered with blood. He came to the hospital the next day, and the dressing was removed, but there was no hemorrhage. A few days later he had another hemorrhage, but not a very severe one. A few days later, while the wound was being dressed, a severe hemorrhage occurred, so severe that the patient almost lost consciousness. The wound was redressed and packed. This was on the 26th of December. The patient was sent to the hospital for observation. On the evening of the 28th of September he had a chill, and then the temperature rose to 105°; the next morning it fell and then again rose to 105°: in the afternoon it again fell and rose. At 4 o'clock the next afternoon he was again operated upon. The wound looked very well and was almost healed, with the exception of a small spot over the knee of the sinus, which looked gray and had not healed. At this operation all the new tissue was removed, and the bone and sinus exposed, all of which looked healthy excepting this one small spot, which had ulcerated through, and from which the blood flowed freely unless controlled by pressure. The sinus was opened and a blood clot was found, not under the point of ulceration, but a half or three-quarters of an inch below it at the bulb. No hemorrhage from the vicinity of the bulb. The neck was opened and the jugular vein excised. No clot was found in it. The neck wound healed in three weeks; the mastoid wound has not as yet completely healed. The patient developed an acute otitis on the other side with mastoiditis, for which a simple mastoid operation was performed. Streptococcus encapsulatus was found in the pus smears.

Here was a healthy sinus, in which an ulceration developed after operation, and a thrombus formed, not in the vicinity of the ulceration, but some distance below it, which must be a very rare occurrence. Usually when the sinus ulcerates through the thrombus forms underneath the inflammatory area.

DISCUSSION.

Dr. Bryant said that he had never seen a case of this kind, but that last summer he had seen a spontaneous hemorrhage from the bulb of the jugular vein in a chronic suppurative case. The patient had previously had five or six rather profuse hemorrhages.

Dr. Richards said that he had never seen any case of the kind.

A Theory of Sound Perception.

Dr. W. Sohier Bryant stated that the previous theories of sound perception are not justified by our present anatomic and pathologic knowledge of the labyrinth, and that the study of the ontogeny, phylogeny, and histology of the cochlea gives no indication of the existence of a structure capable of a sound-selecting function. Our knowledge of the development of the cochlea justifies the assumption that the organ of Corti is developed from the pressure organs of the exterior of the body, and perform a similar but more specialized function. The discovery that the tectorial membrane is an artifact of the long hairs of the Corti cells gives an anatomic basis for the author's theory. This theory—the sensitive-hair theory—is, briefly stated: a sound wave after it has been transmitted through the external and middle ear and has entered the scala vestibulæ and scala media, beats upon the sensitive hair band formerly called the tectorial membrane. A sound wave is not analyzed in the cochlea, as is generally supposed. These long, sensitive hairs appear to the author to be the means of transmission of the sound-wave impulses to the neuroepithelial cells. The sound waves pass over these sensitive hairs much the same way as wind passes over a corn field. The motion of the hairs thus caused passes down the hair to the cell which transforms it into a nerve motion and the tone analysis takes place in the higher centers of the brain.

The theory is based on the histologic structure of the neuroepithelial provided with delicate fibrillæ. The next question is: Will this structure fulfill all the acoustic requirements? We find that it will, and for the following reason: Every property of a sound wave is shown in the characteristics of the wave front; these characteristics are variations in the curve of the wave, and we find that they are transmitted in every particular to the hair band.

DR. RICHARDS said that the paper was a very interesting one to him, for it explains a number of phenomena which are not satisfactorily accounted for by the Helmholtz theory.

If you take a cochlea which can perceive a certain range of sounds and fill it up with vaseline, it does not affect it. If the perception is in the membrane or hair cells you cannot hear them as you do.

DR. BRYANT replied that all mutes, who are totally deaf to cochlear, hear to a certain extent by tactile perception. The tactile sense has a wide range of tone perception. An educated deaf mute has a wider range of tactile tone perception than a normal individual. The undifferentiated tactile sense of the body originally perceived all vibratory stimuli. This is now the case with the lowest of the vertebrates, the amphioxus, which has neither eyes nor ears. Man is able to distinguish many sounds with his fingers, irrespective of any bone conduction.

DR. RICHARDS asked how can a patient hear fundamental tones when the cochlea is opened and a large portion removed, which is ordinarily ascribed to perception. When the cavity of the cochlea is filled by the introduction of vaseline, the vibration of the membrane can be perceived. How is it perceived?

DR. BRYANT replied that the explanation is that there is no differentiation of sound in any part of the cochlea, and that if any part of the organ of Corti is functionating, it can respond to all tones alike. He also said that in literature justification could not be found for the assumption that there is any sound-selecting function in the cochlea. The autopsies on patients, whose ante-mortem hearing tests have been recorded, do not justify or prove anything in the way of the sound-selecting function. The chief argument against the theory of the undifferentiated sound perception by the organ of Corti is tone gaps. Dr. Bryant said that his experience was that tone gaps were very evanescent, and depended very much upon the loudness of the tones used in the tests, as well as upon the intelligence of the patient. He said that abnormal perception of tone, pitch and quality was largely a matter of defect of the middle ear sound-transmitting mechanism. This fact is demonstrable in numerous cases. If the theories of sound-selection were true, the defects of tone gaps would be very frequently met with, which fact is not the case. The majority of people are occasionally troubled by having an indisposition

which might possibly alter the mechanism of the sound-selecting organ, thereby causing the patient to interpret notes as either sharp or flat, under these altered conditions; but, actually, we do not observe this change in tone perception.

DR. RAE asked: If that is actually true, why is it that we have pretty well-established tests to determine where the tone is?

DR. BRYANT replied that the usually accepted tests are erroneous.

DR. RAE said that we cannot always explain it.

DR. BRYANT said that, given a non-sound-selecting sensitive neuroepithelium, what part of its function would we expect to give out first? Naturally, it will be the part which was acquired last, and this is the sensitiveness to high tones. If there is any disturbance in the labyrinth, perception of the high notes will, therefore, be lost first. But since the low notes form the other extreme of perception, they will be lost before the notes in the center of the scale. As Dr. Richards says, the findings at operations and autopsies do not justify the assumption that there is a sound-selecting function in the cochlea. The evidence of almost all observers is at present very strong against the theory that the basilar membrane can perform the sound-selecting function.

DR. KENEFICK said that he had nothing to add to the discussion, and felt incapable of doing so, as he was not sufficiently familiar with the subject. Dr. Bryant had spoken of the fact that the character of the sound wave making its influence felt upon the auditory nerve was indicated by its wave curve. That is very interesting, for the character of the sound is reflected, of course, in the wave which it makes. For example: when the sound of the telephone receiver hurts the listening ear it is producing an incision sound wave which is sharp at the apex, and the process of making telephone sounds agreeable to the ear consists in taking off that sharp point, in order that the auditory nerve terminals may be addressed less incisively. The reverse of this process is the principle of most of the electric devices which aid the hearing by intensifying the sound waves. The problem of tone perception, or tone analysis, by the auditory nerve terminals is a very complex one, and Dr. Bryant is to be commended on the lucidity with which he has presented his contentions.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Regular Meeting, March 4, 1909.

DR. ROBERT LEWIS, JR., CHAIRMAN.

DR. WYETH, PRESIDENT OF THE ACADEMY, IN THE CHAIR.

Paper: Sinus Thrombosis of Otitic Origin and Its Relation to Streptococcemia.*

BY EMIL GRUENING, M. D.

DISCUSSION.

DR. DENCH said that the Section owed Dr. Gruening a debt of gratitude for bringing this subject before them. He himself has had very little experience with blood cultures, although, of course, he has had some experience with cases of sinus thrombosis. He has had 23 cases of sinus thrombosis, in which the internal jugular was excised. Of these, 14 were cured and 9 died: 1 of hemorrhage into the spinal canal, an unusual complication; 1 of general pyemia—(this patient was operated upon late because of a severe pneumonia, which rendered it impossible to operate earlier; he did nicely for three or four weeks, but finally succumbed to general pyemia—streptococci were found in the blood); 3 died of pneumonia, the pneumonia before the jugular was excised; 1 of gangrene of the lung; 1, a young child, died of malnutrition; 1 of hemorrhage into the cerebellum; 1 of gangrene of the neck.

Dr. Gruening had spoken of Gruenert's method of laying open the whole lateral sinus from the sigmoid portion through the bulb to the jugular vein, so as to convert them into one gutter. He had not found them necessary in his cases. In many cases it is possible to inspect the jugular bulb from the lowest portion of the sigmoid sinus, and in the great majority of cases the bulb could be cleared out sufficiently from above. The small segment left between the opening low down in the sigmoid sinus, just above the bulb, and the point where the

* See page 147.

jugular was ligated high up in the neck, just below the bulb, was in the great majority of cases insignificant. In a certain small proportion of cases, however, Gruenert's method would be necessary.

He had been much interested in the differential blood count in the cases reported. According to his own experience, the differential blood count had been very unsatisfactory. He had seen a number of cases of sinus thrombosis in which the differential blood count showed no great departure from the normal. In one of the most severe cases the polymorphonuclear count never rose above 81°, and yet in this case there was thrombosis of the internal jugular, with suppuration of the supraclavicular glands. The absence of a high polymorphonuclear count does not necessarily show that there is no clot in the jugular. According to his experience, the differential blood count as a diagnostic measure, in these cases, had been very unsatisfactory.

Dr. Gruening had spoken of ligating the internal jugular through a diseased portion. Dr. Dench had been obliged to do this twice—once in the case of a young child, the patient being so weak that it would have been impossible to have prolonged the operation so as to ligate the innominate, and another in the case of a young adult, who was *in extremis* when placed upon the table, but could not possibly have withstood the operation of ligating the innominate.

In the two cases above mentioned the innominate vein could be seen, but the ligature could not have been passed around it without disarticulation at the sternoclavicular articulation, and this was impossible in these cases, for the reasons mentioned. This should be the operation of election in these cases, where the clot extended through the entire length of the jugular. Grunert has ligated the innominate on one or two occasions, with success, in these cases.

He was particularly glad to hear what had been said about the tenderness over the internal jugular vein in cases of jugular thrombosis, as it corroborated his own experience. The tenderness, according to his experience, has been in the lymphatic glands and not in the vein itself. He has never been able to feel the cord-like vein, as described by some authors, but there are usually a number of enlarged lymphatic glands over the vein, and these glands are tender. Very fre-

quently these glands must be removed before the vein can be recognized and successfully excised. He regards the enlargement of the lymphatics along the course of the vein as clinical signs of sinus thrombosis, extending into the internal jugular.

The disappearance of the microorganisms from the blood in the cases reported by Dr. Gruening, after ligation of the jugular, is extremely interesting, as it shows that the focus of infection had been cut off from the general circulation. In the case of double mastoiditis, the fact that the germs reappeared when the second ear became involved was of great clinical importance. In Dr. Dench's own case, where the patient died of pyemia, streptococci were found in the blood after excision of the jugular.

As to the value of blood examination, given a doubtful case, the mere fact that there are streptococci in the blood might lead the general physician to have the ear examined, when, otherwise, he might overlook it. Dr. Dench recalled one case, occurring in his practice, previous to the time when blood cultures were thoroughly understood. In this case the total absence of ear symptoms rendered the diagnosis difficult. The diagnosis was finally made on the history of an old aural suppuration and the absence of any visible lesion to account for the temperature. On operation a clot was found in the lateral sinus, extending into the jugular vein; the vein was excised and the patient recovered. In this case, undoubtedly, a blood culture would have cleared up the diagnosis prior to operation.

The speaker had been much interested in the case of sinus thrombosis with streptococcemia which recovered without ligation of the jugular. There is no question but that a certain number of cases of sinus thrombosis will recover, even if the jugular is not ligated. It is a difficult question to decide —when to ligate the jugular, and when not to perform the operation. This is a point which no one has as yet been able to decide. Theoretically, it would be wiser to ligate the jugular in every cases of sinus thrombosis, but, practically, this is not necessary.

The speaker then mentioned 48 cases of sinus thrombosis. Also 28 cases of sinus thrombosis in which the jugular was not excised, of which 24 cases were cured and only 4 died. In all of these cases the clot was removed from the sinus by

operative interference, but it was not necessary to interfere with the jugular. These statistics show that in a certain proportion of cases excision of the jugular vein is not necessary to cure sinus thrombosis.

Dr. Whiting said he understood the question which the essayist had raised was: Given a suppurating ear and streptococcus in the blood, is one justified in making a diagnosis of a clot in the sinus? That seems to be the sum and substance of the paper.

We know that the streptococcus does exist in a number of diseases in which clots do not form in the sinuses. It is found in fairly considerable numbers in cases of erysipelas, and these patients recover without any clots in the sinuses, so far as we know. We also know that streptococcemia occurs in cases of malignant endocarditis, where patients die, and yet there is no clot; also in cases of sore throat, and the patients recover, and the clots are not found in the veins or sinuses. It does not necessarily follow that because you have streptococcemia you must have clots in the sinus. In his judgment, there have not yet been a sufficient number of cases reported to prove that it necessarily follows. It certainly does not follow in the cases he had mentioned.

In regard to the question as to whether or not a clot is found in the sinus where there is no streptococcemia, the findings of Dr. Gruening would be strongly corroborative of that view. In nine of these cases the streptococcus was found where there was no clot, and in the tenth there was a clot, notwithstanding there was no streptococci in the blood. It would seem from his finding that certainly one can go so far as to say that if one could eliminate from the diagnosis of the patient's condition endocarditis, erysipelas, streptococcic sore throat and other suppurating foci, and if a focus is found in the ear and streptococci are found in the blood, one is justified in looking for a clot in the sinus, for you can be fairly certain that they are getting there from the infected ear. Whether in these circumstances the surgeon would be called upon to tie off the jugular vein in every case, we have not yet sufficient data to know, but certainly the presence of streptococcus in the blood in connection with a suppurating ear is a most significant factor, and should lead us pretty certaintly to conclude that it is a wise procedure to tie the jugular vein in such a case.

DR. LIBMAN and DR. CELLER: We have been engaged in the study of infections of otitic origin by means of a blood culture for a period of about ten years. The value of such studies was first made clear to us by a case in which the clinical diagnosis could not be definitely made by the surgeon, and in which the finding of streptococci in the blood led us to believe that it would be wise to explore the mastoid, because no other focus could be found from which the streptococcus might have entered the blood. A sinus thrombosis was found in that case. There has been much difference of opinion among authorities as to the most common infecting organism in acute otitis media. The early authorities considered the pneumococcus the most infecting agent. More recent investigators (Leutert, Funke, Suepfle, Wittmaack) have found the streptococcus most frequently. Hasslauer is the only recent author of prominence who claims that the pneumococcus is the most frequent invading organism. In our study of about 360 cases we have found the streptococcus most frequently, the streptococcus mucosus next most frequently and the pneumococcus in the smallest number of cases. It is to be noted that while the streptococcus mucosus is a streptococcus in morphology, it is more closely allied from a biological standpoint to the pneumococcus.

Nothwithstanding the fact that the pneumococcus has been found frequently by many authorities in the middle ear, and notwithstanding the fact that we have found the organism in a certain number of cases, there are hardly any records of sinus thrombosis being due to the pneumococcus. We have not had any case, and the few cases that are cited in the literature are not absolutely proven. It has been shown in our laboratory by Dr. Buerger and Dr. Ryttenberg that the pneumococcus can be so changed by its sojourn in the body that it may be difficult or impossible to differentiate it from a streptococcus. This fact must be taken into consideration, for it might occur that we might find what looked like a streptococcus in a sinus and it might prove to be a changed pneumococcus. Thus far we have not had any such experience. It is well to study this question still further.

One of the main points of interest is the study of the conditions under which bacteria are found in the blood in cases of otitis media, with and without complications. In our ex-

perience we have not found bacteria present in cases of pure otitis media, mastoid disease, extradural abscess or brain abscess. Our positive results have all been in cases of meningitis and of sinus thrombosis. In the cases of sinus thrombosis we have found streptococci most frequently in the blood, occasionally the streptococcus mucosus, and rarely an organism like the proteus bacillus (the last mentioned in very old cases of mastoid disease). In meningitis cases we have found the pneumococcus, streptococcus and streptococcus mucosus. In our more recent studies we have found positive results more frequently in cases of sinus thrombosis than we did formerly, probably because the cultures are being taken earlier.

In some cases of sinus thrombosis the blood culture is negative. We are not yet in a position to explain all the negative results. In some cases the clot itself is sterile and, naturally, then no bacteria are to be found in the circulation. It is possible that in some cases the patient develops an increased bactericidal property of the blood. In other cases pieces of the clot break off, lodge in the lungs, produce abscesses there, and still no bacteria are found in the blood. The pathway in such cases is from the sinus, through the jugular vein, into the heart. This explains a certain number of negative blood cultures. According to our recent studies, the cases in which streptococci were found in the blood after disease of the mastoid had been properly attended to, and when clinical symptoms still persisted, were cases of sinus thrombosis.

Dr. Whiting has pointed out the possibility that one might become confused because of the possibility of the presence of an erysipelas. According to our experience, it is unusual to find streptococci in the blood in cases of erysipelas, and, furthermore, the erysipelas could be recognized and taken into account in explaining the symptomatology in a given case. It is true that in so-called "malignant endocarditis" there are often streptococci in the blood, but that disease is not a primary disease, and if in such a case an otitis media is present, it is very possible that the otitis media is the cause of the infectve endocarditis. As far as we know at the present time, as soon as the valves of the heart become infected in a case of general infection from any focus, the patient is generally lost.

The question of possible confusion because of an angina is

a very important one. In our experience we have had no trouble from this source. The cases in which an angina has been the cause of a general streptococcus infection have generally produced distinct local symptoms, and such general infections are not very frequent. Nuernberg, in attempting to avoid the difficulty met with under these conditions, suggested making a blood-culture from the sinus at the time of operation and one from the peripheral veins. If he found more bacteria in the blood of the sinus than in the blood of the peripheral veins, he concluded that the disease of the sinus was the cause of a general infection and not a possible tonstillitis. This method could be tried in cases of suspected sinus thrombosis in which the patient also had tonsillitis. It would be difficult, if there was pus in the neighborhood, to be sure of getting the proper result. In a recent case of sinus thrombosis, in which there was no tonsiliitis present, we could not obtain the blood from a peripheral vein, and, therefore, aspirated some from the sinus. It proved negative culturally, and the clot was afterwards found to be a sterile one.

What, according to our experience, is the value of blood cultures at the present time in otologic work? A positive blood-culture result is valuable if there is doubt as to the existence of a sinus thrombosis after the patient has been operated upon for mastoid disease. In most cases the diagnosis is clear enough clinically, but in a certain number of cases in which the mastoid was thoroughly cleared out, and in which there were clinical symptoms still present and which the otologist was not sure that there was still further local disease, the finding of streptococci in the blood has given the indication to explore the sinus, and in all of the cases of this type a sinus thrombosis was found. It occasionally happens that even before the mastoid is operated upon, when the patient has otitis media, the local signs may be insufficient to account for the marked febrile and other general disturbance, and in such a case a positive blood finding may indicate that there is a more serious trouble locally than had been suspected. In a recent case of this kind the patient had a temperature running up to 103° nearly every day and had an otitis media. The otologists did not believe there were sufficient local signs to indicate operation. A blood culture was taken and streptococci found. At operation not only was mastoiditis present, but a clot was

also found in the sigmoid sinus. In that case the jugular vein was not ligated, and the streptococci are still in the blood.

In certain cases, after the sinus has been explored and a clot found, and the jugular vein has not been ligated, the persistence of streptococci in the blood has given the indication to tie the jugular vein. In these cases the streptococci disappeared from the blood very rapidly, with two exceptions; in the one case it was necessary to pack the jugular bulb, and in the other case an infective endocarditis developed, the jugular vein not having been ligated early.

The most valuable field for the blood-culture studies is in border-line cases, in which it is very difficult sometimes to come to any conclusion without the use of blood cultures. The first case of this type which we met was that of a boy who was sent to the hospital for supposed typhoid fever. He had an otitis media on the left side without perforation, and presented slight tenderness of the tip of the mastoid. We took a blood culture, expecting to find typhoid bacilli, but, instead, we found streptococci. The Widal reaction was negative. As there was no other focus that could be found from which the streptococci invaded the system, and as no other cause was found for the fever, it was considered justifiable to explore the mastoid. To our great surprise, a sinus thrombosis was found. After operation the blood was sterile; the boy recovered.

Later a woman was admitted to the hospital with an intermittent fever and large spleen. She had an old otitis media and doubtful signs of mastoid disease. Streptococci were found in the blood, and no focus was found in the body, except the otitis media, from which the streptococci could have entered. She was operated upon, a large thrombus found and she recovered.

On the other hand, there are cases of otitis media, in which the finding of typhoid bacilli in the blood shows that the marked fever and general disturbance are due to typhoid fever, and it is not necessary to presuppose any severe complication of the otitis media.

In some cases it is very difficult to come to a conclusion, unless one judges carefully all the facts in the case. A woman was admitted to the ward with a history of pneumonia for two weeks and a history of otitis media for two days. There was

doubtful evidence of mastoid disease. We found streptococci in her blood and considered it warrantable to advise exploration. A sinus thrombosis was found. If she had had pneumococci in the blood one would have had to remain in doubt, because it would have been more than probable that the pneumococci in the blood came from the diseased lung. Another case had a swelling around the lower jaw for two weeks, with enlargement of the glands in the neck. There was a history that the patient had a paracentesis done two days before, by an otologist who claimed to have found pus. The patient also had an intramuscular abscess in the right calf. In that patient we decided that if we found streptococci in the blood it would be unsafe not to explore the mastoid region. The infections around the jaw are not apt to give a bacteremia. Streptococci were found in the blood, and at operation not only was mastoid disease found, but there was pus in the sinus.

These complicated cases are more apt to be found in large general hospitals.

If the patient has been operated upon for sinus thrombosis and the jugular vein is tied and the bacteria disappear from the blood, it is clear that the entrance of infection to the system has been stopped. A negative blood-culture in these cases is of great value, for it helps us decidedly in excluding an infective endocarditis.

It is interesting to know how quickly the blood gets rid of the bacteria after the clot has been removed, or after the jugular vein has been ligated. In our earlier cases we found that the bacteria disappeared from the blood within forty-eight hours. In the more recent cases we have made our cultures twenty-four hours after operation and found the blood negative in some cases. In one case we found the bacteria had disappeared within eight hours after ligation of the jugular vein. These observations show that in most of these cases the bacteria have been discharged from the local focus and were not multiplying in the blood.

As soon as we get any cases of mastoid disease or otitis media without sinus thrombosis in which streptococci are found in the blood, we shall be very glad to report them. According to our experience, in any local infection, no matter how small, it is possible that bacteria may at any time enter the circulation. We shall continue our studies on the pure

mastoid cases to see how often a streptococcemia occurs. Even if bacteria are found at times, in such cases the indications which we have made would not be materially changed, because we attempt to lay stress mainly on the value of the positive blood-cultures for giving indications of a possible sinus thrombosis in cases in which the mastoid has already been operated upon, and therefore the mastoid can not be blamed for the persistence of the streptococcus.

Dr. Duel stated that his views on this subject had become greatly changed as the result of some investigations made within the past 48 hours, after a discussion with Dr. Jonathan Wright, concerning the recent work he had been doing at the Laboratory of the Manhattan Eye, Ear and Throat Hospital. In view of what he had gathered from this short investigation, he believed that the conclusions reached by Dr. Libman were altogether too sweeping, and that further investigation would teach us not to interpret results of examination of the blood as definitely settled, as he had stated.

Körner collected 314 operated cases of sinus thrombosis, with 180 recoveries, showing an average recovery of 58.3 per cent. According to his statistics, jugular ligation before evacuation of the clot showed a better result than those ligated after its evacuation, or in those cases in which there was no ligation of the jugular. However, this difference did not amount to more than 3 per cent.

Toubert's statistics were of greater value. One hundred cases operated upon within the first week after symptoms of intracranial complication appeared, showed a recovery of 75 per cent, while of 80 cases operated upon more than a week after symptoms of intracranial complications appeared, only 37 per cent, or half the number, recovered. This shows that prompt recognition and early operation have more to do with the results than the particular method of obliterating the sinus. Given, then, a case in which clinical signs of sinus thrombosis appear, where there was no concomitant disease which rendered the diagnosis doubtful, experience had shown that early interference saved a large majority, while delay increased the mortality greatly, and failure to operate was followed by almost certain death.

The cases in which untoward symptoms developed were likely to be those with complications like pneumonia, nephritis,

or tuberculosis, or those having septic throats with accompanying adenitis—as in all the acute exanthemata—and presented problems which none could face, at present, without misgivings as to diagnosis. If a blood culture in such cases could furnish evidence which on the one hand would indicate the necessity of an operation, and on the other, that no operation should be performed, then indeed a great advance has been made, and we could thank the bacteriologist for a diagnostic sign which would undoubtedly save many lives.

Dr. Duel said that when he first heard these cases reported and the claims made by Dr. Libman, he regarded the presence of streptococcemia in a case of suppurative otitis as being of greater diagnostic value than he is able to ascribe to it after a more careful consideration—after reading the results of other investigations and after talking with others interested in this research. He had tried to prevail upon Dr. Wright to attend the meeting to-night and to discuss this subject, but had been unsuccessful. He had, however, a letter from Dr. Wright conveying some views on the subject, which he begged to read:

"*Dear Dr. Duel*:

Referring to our recent conversation, in regard to the interesting claims made by some otologists (that by the detection of a bacteremia, or the presence of streptococci in the blood of the general circulation, it is possible to assert that, in mastoid suppuration, we have, in any given case, to do with a cerebral sinus thrombosis), I send you herewith references to literature, which will disclose considerable evidence that in various infections, some of them very trifling, bacteremia has been revealed by blood culture (and otherwise) in a considerable number of cases.

I also refer you to observations upon latent microbism in various organs which it seems to me have bearings upon the subject.

It is entirely too early to make any positive statement from our own culture work, but from the evidence to which I draw your attention, it would seem prudent to accept the presence of bacteremia in mastoid suppuration as a pathognomonic sign of sinus involvement with considerable reserve.

From all that we are learning of the physicochemical conditions of the blood, from the revelations of direct observations, it seems quite likely that the evidence for the presence, or the

absence, of bacteria in the blood is largely dependent on how much of it can be examined in any given case. It seems also likely that there are states of the system, not betrayed by clinical symptoms, during which bacteria in considerable numbers are carried from one spot to another in the circulation. Inasmuch as bacteremia has been detected in comparatively mild cases of throat inflammations, I think we can hardly afford to postulate the existence of extensive septic thrombi in any case. It seems quite likely, however, that quantitative estimations of the number of bacteria found in a case of suspected sinus thrombosis may be of considerable advantage if a reliable and practical technic can be evolved.

"Very truly yours,

"JONATHAN WRIGHT."

Dr. Wright had cited a number of references which seem to have a very definite bearing upon the question. In *Virchow's Archives,* Fraenkel reports 60 cases "Concerning the Behavior of the Brain in Acute Infectious Diseases." Examinations were made of the blood and brain tissue, and of the vessel walls in cases of a variety of infectious diseases after death, and in a large percentage of these, bacteria were found. In twenty of them, for instance, streptococci were found (in cases of pneumonia, erysipelas, diseases of the joints with pus, and other conditions of that kind); 9 contained staphylococci; 4 staphylococci and streptococci; 6 streptococcus mucosus; 1 Fraenkel's pneumococcus; 5 diphtheria; 6 the typhoid bacillus; 3 the colon bacillus; 4 mixed and other organisms; 1 the proteus, etc.

In another article, the examination of the organs of patients dead of phthisis, within a few hours after death, by Ravenal and Irwin, reported in the third and fourth annual reports of the Phipps' Institute, showed that, among numerous other bacteria, the streptococcus was present in 95 out of 123 cases. One can hardly escape the inference that they and others arrived in the various organs intra vitam by the circulation, owing to disturbances of the system antecedent to death, but the authors do not venture to assert as a result of their frequency in the tissues that the streptococci are often the immediate cause of death in these cases. Leibermeister (Ref. *Centralbl. f. Bakt.,* Bd. xliii, Heft 1-5) could demonstrate in the blood of 30 consumptives t. b. 11 times.

In view of these findings, and also in view of one finding that we have had at the Manhattan Eye, Ear and Throat Hospital, I am inclined to doubt the advisability of accepting the presence of bacteremia in a case with suppurative otitis as sufficient cause for invasion of the sinus, in the absence of some clinical symptoms. We must remember that questionable involvement of the sinus occurred in the very cases in which the ear suppuration resulted from a septic throat in one of the acute exanthemata, tonsillitis, croup, or some allied condition, in all of which the presence of streptococci or some other virulent form of bacteria are known to be present. Even admitting that we might invade the sinus if it were perfectly certain that, with the discharging ear and the presence of bacteremia this were indicated, in the absence of any other cause for bacteremia, we should not be justified in operating in any of these cases known to produce a bacteremia, even when suppurating otitis is not present, without most definite clinical signs in addition.

DR. DUEL supplemented his previous remarks by reporting another case. Within the last two weeks they have been investigating various cases of mastoiditis at the Manhattan Eye, Ear and Throat Hospital by blood cultures taken at the time of the operation, and out of seven examined thus far, one positive case had been found. This occurred in a patient in his own clinic, which was operated upon by Dr. Kerrison. This patient had short chain streptococci in his blood, but no other signs of sinus thrombosis except the presence of the bacteremia.

DR. LIBMAN AND DR. CELLER said: Nothing that has been brought up in the course of the discussion has caused us to change our viewpoint, because we feel that a number of valuable operations were made more certain in their indications by the blood-culture work. There is no doubt that some cases of sinus thrombosis were operated upon sooner than they otherwise would have been. As regards the point that has been brought up regarding the difficulty of estimating the number of bacteria in the blood, there is no difficulty about that point. One has only to make cultures in solid media in plates, besides making the bouillon cultures. The data given by Dr. Duel are of no direct significance in connection with our work, as they are based on reports of studies made after

death. In recent years we have learned that there is very frequently an ante-mortem or post-mortem invasion of bacteria in cases in which there were no bacteria in the blood a few days before death. I have seen cases in which the blood showed no bacteria before death and showed streptococcus six hours after death.

As regards the statement of Dr. Richards about the possibility of having metastases when the bacteria have not been found, such a condition of affairs does at times occur. Those are cases in which the bacteria are distributed early in the disease through the body and then no more are discharged from the local focus. Later on, abscesses form in the places in which the bacteria have been deposited, and not necessarily in all the places at the same time. The mere fact that there were metastases shows that bacteria or bits of infected clot must have been present in the blood at some time.

Many cases of streptococcemia recover, provided you can control the local infection from which the bacteria are entering the body, and provided the heart valves are not involved. The occurrence of a streptococcus in cases of otitic disease in which the mastoid has been thoroughly operated upon and in which general symptoms still persist, gives the indication that there is a local focus that should be controlled. And if you can find no other point from which the infection may be entering, the only place from which you have a right to expect that to come after the mastoid region has been thoroughly exposed is the sinus or jugular bulb. A meningitis which might be causing a bacteremia is easily recognized clinically and by means of lumbar puncture.

One point brought up by Dr. Richards recalls a case in which the streptococcus remained in the blood after the jugular vein was tied. When we reported that streptococci were still present in the blood, the boy was sitting up in bed, but the same evening there was a chill and a rise of temperature. The bulb was cleared out and was packed, and then the boy recovered. This is a very important case showing that in some cases after the jugular vein has been tied, bacteria may enter the blood by way of the petrosal sinus in the manner which Dr. Richards has indicated.

There are two further points to emphasize: The first is that the number of bacteria in the blood gives no indication

of the severity of the local focus in these cases. We have seen very severe cases with very few streptococci in the blood. The other important point is that one must be careful in judging of the significance of a positive result in blood-cultures taken during or directly after an operation on the mastoid. There is always a possibility in these cases that a certain number of bacteria may be forced into the blood current. We have no data concerning such an occurrence in mastoid disease, but we have seen it in operation on other bones. In our experience, thus far, one gets very few organisms in the blood in these cases and the bacteremia disappears rapidly.

DR. DUEL replied that he was not claiming to be a bacteriologist—he knew little about it, but this work was done by Fraenkel, and was reported in the last *Archives,* and the investigations were made immediately after death, according to the report of the article.

DR. KENEFICK, referring to the difficulty of applying these blood-culture tests, told of a case occurring in his service at the Foundling Hospital. The remarks of the evening had been confined to adults, and to cases in which one ear only had been involved, but when cases occur in infants under three years of age, and where there is a complicating pneumonic process in the lung, and where both ears are involved, as Dr. Duel had expressed it, the question of diagnosis becomes a very serious problem. The diagnosis in this case was made post-mortem. An extensive process was found in the lung, with adhesions; there was a primary occluding thrombosis of the jugular bulb extending one-third of the distance to the clavicle, and all the large venous vessels of the brain were thrombosed. The mastoid process was not involved. It was perfectly normal, and he was able to make out a point in the posterior inferior floor of the tympanic cavity through which, he is satisfied, thrombotic extension into the jugular bulb occurred.

He had also had another case of the same age under his care, running a temperature chart exactly similar. The pediatricians were able to eliminate all other causes of high temperature, but although the case ran a similar temperature to the first it recovered after free drainage had been established through both membrana tympani. In the first case no blood culture had been made; had this been done, it might have given a hint as to the true condition, although with the pneumonic

condition, operative success was doubtful. In the second case a blood culture was made and was negative.

Dr. Kopetzky said that the conflicting views which had been presented left but little solid ground upon which to stand. Undoubtedly Dr. Libman was correct in saying that we spoke from a limited experience, yet even that experience already gave contradictions in results. This might possibly be due to mistakes in technic, and if there is any diagnostic value in the finding of streptococcemia, it would seem that we should know the correct method of obtaining the pathologic findings. The question as to whether or not streptococci are to be found in the blood in other conditions besides sinus thrombosis is another side of the question, which must be determined beyond a doubt. Up to the present time this is not satisfactorily settled, and until it is, the final diagnostic value of Libman's findings must be accepted with reserve. Furthermore, it appears as if the quantitative estimation of the amount of cocci in the blood must be of value, and as yet no faultless method for such estimation had been proposed. The otologist is not ready as yet to operate on the sinus in cases which present only the finding of bacteria in the blood, unless this is accompanied by other marked symptoms. Even the two cases presented by Dr. Gruening had symptoms distinctly marked for three or four days, and the diagnosis was made by the otologist and not by the pathologist. Again, the cases where there is a bacteremia present in the blood and which recover without opening the sinus, adds another factor toward causing us to hesitate about operating simply on the finding of bacteremia.

Dr. Celler said there is evidently no relation existing between the number of colonies in the blood cultures and the extent of the lesion; as an instance, I might cite a case occurring early in our series in which the blood culture showed four colonies of streptococci in ten cubic centimeters of blood. This case was one in which clinically the diagnosis of sinus thrombosis had not been made. At the time of operation, the lateral sinus was found to be thrombosed. The patient subsequently died, and at post-mortem it was found that the thrombus extended as far as the torcular Herophili.

Dr. Gruening said that the skepticism shown this evening was very salutary and would help to clear the situation. No theory had been propounded, only ten cases of sinus throm-

bosis were reported, and these were diagnosticated from the clinical symptoms alone. Blood cultures were made in these cases, and the pathologist found positive results more frequently than negative results. The patients who had streptococci in the blood recovered after ligation of the jugular vein. This is an actual experience, and need not be doubted. Whether with larger material the results will be identical, we do not know.

It has been said in this discussion: If, in ear diseases, the streptococcus is found in the blood, and this is indicative of sinus thrombosis, why may it not be some other sinus that is affected, e. g., the cavernous or the petrosal? The fact is, we know that the lateral sinus is generally affected.

The skeptic attitude is stimulating, but there is also a positive side to this question, which will be strengthened by further experience.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Regular Meeting, April 9, 1909.

DR. ROBERT LEWIS, JR., CHAIRMAN.

A New Instrument for the Inspection of the Posterior Nares, Eustachian Tubes, Pharynx, and Larynx.

DR. HAROLD HAYS said that all were familiar with the salpingoscope used through the nose, in order to get a view of the Eustachian tubes, but those who have employed this instrument have not been able to get a distinct and definite image. The electric tongue depressor is limited in its capacity, as only the posterior pharyngeal wall and the oral cavity are plainly seen. Some few years ago an instrument for the examination of the Eustachian tubes and posterior nares was devised, but it could not be kept in position so as to give a distinct view. The instrument now presented was devised to obtain a view of the posterior nares and Eustachian tubes, and is based on the principle of the cystoscope.

Heretofore it has been difficult to see adenoids, particularly in children, and to make pathologic examinations of any part of the upper air passages not distinctly in view when the tongue is held down by a depressor. This instrument, called the pharyngoscope, is arranged with a horizontal and vertical shaft, the horizontal part containing the telescopic arrangement in the center, and electric lights on either side at the inner end, the vertical part acting as a handle and containing the wires for connection to a rheostat.

The instrument is inserted in the mouth until the inner end is about one-sixteenth of an inch from the pharyngeal wall. The patient is then told to close his mouth, when the muscles become relaxed. The instrument can be retained in position for ten or fifteen minutes without any gagging. When the instrument is in position, with the lens pointing up, a distinct view of the pharyngeal vault is obtained. By rotating the inner tube or telescope the lens can be so placed as to see any

point desired—the Eustachian tubes, posterior nares, epiglottis, vocal cords, etc. With this little instrument Dr. Hays has been able to examine many pathologic conditions not usually seen—for example, a patient came to the New York Eye and Ear Infirmary, who had been treated for eustachian catarrh. By inserting this instrument, a very definite view was obtained of both eustachian prominences; the left one was perfectly free, but the other was entirely obstructed by a large adenoid growth. In another patient, suffering with chronic middle-ear catarrh, by means of the pharyngoscope small hypertrophied lymphoid follicles were seen around the orifices of the tubes. He has been able to examine the larynx in patients with extremely sensitive throats, who could yet retain the instrument in place for ten or fifteen minutes, allowing a careful examination to be made.

Another application of the instrument is now being worked out, namely, the possibility of catheterizing the eustachian tubes through the mouth instead of through the nose. Catheters on the style of the ureteral catheter will be passed through the instrument in such a way that when they enter the tubes the instrument itself can be withdrawn and the catheter still remain in place. One can thereby pass a sterile catheter through a sterile instrument into the middle ear, without fear of causing infection. The instrument cannot be sterilized by boiling, but, like the cystoscope, must be formalinized.

Dr. Hays showed several pictures of conditions seen through the instrument, and also demonstrated its application on a patient.

Dr. Fridenberg said that his experience with the instrument was limited, but that it seems to be a very practical one, and is easily used. It would be especially valuable for the examination of the larynx in children. In using the laryngoscope, when the child moves, the mirror has to be taken out and replaced, but with this instrument in place the child can struggle and cry as much as it likes and yet one can get a good view of the throat.

Another point is that the mouth can be kept closed while the instrument is being used. It promises to be a valuable method for studying the normal changes in the larynx during phonation. Still another field of usefulness is the inspection of the posterior nares in cases of suspected sinus disease.

Every one knows how difficult it is to trace the pus and discover its point of origin; but after the nares have been washed out this instrument can be put in place and allowed to remain for five or ten minutes until the pus appears.

It does not give the ordinary laryngoscopic picture; so one is liable to be a little confused until the customary landmarks are found. In the drawing which he had made of the base of the tongue, it seems as though the patient had a marked hypertrophy of the lingual tonsil.

(Demonstration of the appearance of the throat with the instrument.)

The illumination is excellent, and the instrument can be kept in place for quite a long time. It certainly is an exceedingly practical and valuable means of examining the pharynx.

Dr. Hays said that one point of which he had forgotten to speak was the suggestion made by Dr. Fridenberg that it would be a valuable instrument to take to the bedside for the purpose of examining the mouth of an unconscious patient. Also, though the instrument was intended for diagnostic purposes, rather than treatment, yet the patient can hold the instrument and enable the physician to go through a considerable part of the treatment through the nares, and can look at the throat at the same time. Its capabilities and application were being carefully studied, and no doubt many improvements can be made which will increase its usefulness.

Stereoscopic Demonstration of Ear Specimens.

Dr. Martin Cohen.

1. Drum membrane, with chain of ossicles—posterior view.
2. Tympanic cavity and labyrinth—view from above.
3. External auditory canal with tympanic membrane and articulation of malleus and incus.
4. Bony labyrinth with aqueductus vestibuli et cochleæ, posterior view.
5. Membranous labyrinth.
6. Opening into antrum.
7. Simple mastoid operation.
8. Radical mastoid operation.

Dr. Duel said that this was a most valuable method of teaching anatomy, as it gives students an exact picture of the

condition, and that one could profitably spend an evening over these pictures.

The object of these stereoscopic slides, which were prepared at the Anatomical Institute in Vienna, is to illustrate perspectively the anatomic relations of the various important landmarks of the temporal bone.

If this method of studying anatomy with the stereoscope were employed generally, it would greatly facilitate the comprehension of anatomic relations.

These specimens demonstrate the external, middle and internal, surgical relations of the ear.

Report of Cases of Herpes Oticus With Remarks on the Syndrome of "The Herpetic Inflammations of the Geniculate Ganglion" and the Zoster Zones of the Auricle.

DR. J. RAMSAY HUNT reported three cases of herpes oticus with neural complications, and still further elaborated the subject of herpetic inflammations of the geniculate ganglion. (*Journal of Nervous and Medical Diseases,* 1907, 1909, and *Am. Journal of Medical Sciences,* 1908.)

CASE 1.—(Herpetic inflammation of the geniculate ganglion of the VII.) Man, aged 68. Onset August 16, with severe pains in right mastoid region, swelling and tenderness of the auricle. The next day there developed complete facial paralysis on the right side. Sense of taste impaired in right trigeminal area. Tear secretion normal. Four days later a constant tinnitus aurium, followed by deafness in right ear. No vertigo, no nystagmus. An herpetic eruption appeared upon the concha, tragus, antitragus and lobule. (A singe large vesicle on the tympanic membrane.)

CASE 2—(Herpetic inflammation of the jugular ganglion of the vagus).—Man, aged 19, following exposure to cold, had pains in the left ear in conchal region. Four days later developed left facial paralysis. No auditory symptoms. Status praesens: Left facial palsy complete, taste sensation diminished in left trigeminal area; hearing normal; tear secretion increased on the left. A small localized eruption of herpetic vesicles situated in the cleft between the lower half of the auricle and the mastoid process; none within the canal.

CASE 3 (Herpetic inflammation of the jugular ganglion of the vagus).—Girl, aged 18; onset in August, 1907, with pains in the lobule of the left ear and mastoid regions—very sharp

and lancinating in character. On the third day there appeared a small crop of vesicles posteriorly in the cleft between the lobule and the mastoid process. No auditory symptoms, no facial palsy. A severe postherpetic otalgia persisted, that was still manifest in February, 1908. Examination of the ear negative.

The syndrome under discussion is characterized by the general symptoms of zona; an eruption of herpetic vesicles on the cephalic extremity (head, face, ear and neck) in conjunction with facial palsy and auditory symptoms. The eruption may be situated in any of the zoster zones of the cephalic extremity.

Herpes facialis—Gasserian ganglion.

Herpes oticus—Geniculate ganglion of VII and jugular ganglion of X.

Herpes occipito collaris—II, III and IV cervical ganglia.

The neural complications, facial palsy, and symptoms referable to the auditory nerve (cochlear and vestibular divisions) may occur singly or in combination with the eruptive manifestations in any of the above mentioned zoster zones. Hence there may be Bell's palsy associated with an eruption of zoster vesicles in any of the cephalic zones, or there may be auditory nerve symptoms in conjunction with an eruption of zoster in the cephalic zone; or both Bell's palsy and auditory disturbances may occur in combination with zoster in the cephalic zone.

When these palsies occur they are to be referred to an herpetic inflammatory process in a geniculate ganglion and the ganglion of the acoustic nerve. It is also possible in some cases that the auditory nerve is involved secondarily by an extension of the inflammatory process along the nerve sheaths in the depths of the internal auditory canal.

Dr. Hunt divides the cases of herpes oticus into two groups; one, referable to the geniculate ganglion of the VII; the other, to the jugular ganglion of the X. The zoster zone for the geniculate is represented on the concha and external meatus, tragus, antitragus, ant-helix, fossa of the ant-helix, and the lobule. That for the ganglion jugulare vagi, on the posterior wall of the auditory canal, posterior half of the tympanic membrane, and a strip of the posteromesial surface of the auricle and adjacent mastoid region. He also expresses the opinion

that the auditory ganglia, the ganglion spirale, and ganglion of Scarpa may be primarily involved in zona. These ganglia take their origin as outgrowths of the neural ridge, from which the cranial ganglia of the spinal type arise, and, like these ganglia, may be brought within the realm of herpes zoster—a disease characterized by an inflammation of ganglia of the so-called spinal type—so that in an acute unilateral disease of the auditory nerve, accompanied by symptoms of a mild general infection, especially after an exposure to cold, the possibility of a primary and isolated herpetic inflammation of the acoustic ganglia must be considered.

The presence of lymphocytosis of the cerebrospinal fluid, which is known to occur in herpes zoster, would be important evidence of the existence of such a condition, and would serve to differentiate it from the so-called "rheumatic palsies" of the auditory nerve.

In conclusion, Dr. Hunt emphasized the importance of testing the hearing in all cases of zona of the cephalic extremity, in order to detect mild degrees of impairment, which would probably escape notice unless especially investigated.

TYPES OF THE SYNDROME.

I. Herpes zoster facialis; oticus; or occipito collaris, with facial palsy.

II. Herpes zoster facialis, oticus, and occipito collaris, with acoustic symptoms (deafness, and symptoms of Meniere's disease).

III. Herpes zoster facialis, oticus, and occipito collaris, with facial and auditory symptoms combined.

IV. Herpetic inflammation of the acoustic ganglia with auditory symptoms alone.

DR. LEDERMAN asked Dr. Hunt whether there is any connection between these cases of herpes zoster and infection involving the cerebral cavity in cases of sinus thrombosis or meningitis where herpes of the auricle is noted. Dr. Gruening has reported several cases where he noticed herpes in this region associated with this serious form of infection.

DR. HUNT replied that a localization of herpes on the nose and lip is not uncommon in meningitis, belonging probably to the so-called "infectious group" of herpes, but it is also very probable that an extension of the inflammatory process from

the ear along the nerve sheaths may involve the geniculate ganglion, thus giving rise secondarily to herpes zoster of geniculate origin, and this would be important evidence of the extension of the inflammatory process toward the cranial cavity. He has observed one case of endothelioma springing from the middle ear, in which herpetic pain and vesicles occurred in the geniculate area, and which he regarded as indicating a secondary involvement of the ganglion from without, such as occurs in the spinal ganglia in cases of malignant disease of the vertebrae.

Clinical Symptoms of Labyrinthitis.*

By Philip Kerrison, M. D.,

New York.

DISCUSSION.

Dr. George E. Davis said that it was a most interesting paper, and doubly so since he also was a student and assistant to Dr. Alexander, who, in conjunction with Dr. Barany, had done much to elaborate and make practical the functional tests in the diagnosis of labyrinthitis. He wished to say in regard to Dr. Kerrison's statement as to his disbelief in the correctness of Dr. Alexander's and Dr. MacKenzie's observations as to the frequency of the reactions (nystagmus) of the galvanic tests, in their experiments on the deaf and dumb, when other tests proved negative—particularly the caloric test—he would offer the explanation that as the contact surface for the caloric test is so limited for the application of heat and cold, that it is just possible one might not get a reaction, whereas you would obtain it from the galvanic test. A point in evidence is the fact that for a short time even after an operation on the labyrinth the galvanic reaction may be elicited.

Responding to Dr. Graef's remark, "that he did not believe the ear had anything to do with the reaction (nystagmus) after turning, and that same was due to the attempt on the part of the patient to fix objects with his eyes while being turned and to recover when the turning ceased," Dr. Davis

* See page 493, September, 1909, Annals.

said that to demonstrate the error of Dr. Graefe's contention it was only necessary to mention that the "turning" test is made with the eyes closed, or with opaque glasses, to prevent "fixation," and, indeed, the reaction (nystagmus) is even greater when fixation is obviated. Moreover we get nystagmus with the caloric and galvanic tests when the patients sit perfectly quiet.

Dr. Lederman inquired whether or not, in testing with the caloric test, where the test is negative, it would not be possible to have some form of cerebral growth which would cause symptoms of nystagmus, vertigo and nausea. Some years ago he had presented a case before the Section showing the symptoms which may arise from pressure on the semicircular canal. The patient was a colored woman, who had been shot with a bullet, which had lodged in the external wall of the internal ear, resting on the facial aqueduct and horizontal canal, with symptoms of facial paralysis, vertigo, nausea, etc. This condition had existed for three years when he first saw her. She had then a chronic suppurative otitis with a fibromyxoma filling the canal, with pus in the canal and middle ear. She was 24 years of age, and was unable to go around without assistance, on account of falling to the affected side. It was impossible to examine the middle ear at first on account of the growth. That was removed by means of a snare, and after removing it and cleansing the canal, the foreign body was seen in the ear, surrounded by osseous deposit. It was impossible to remove the bullet through the canal, and a radical operation was done, but the bullet was wedged in so tightly that it had to be chiselled away. Seventy grains of lead were obtained after the operation. The symptoms of vertigo and nausea disappeared in about four weeks, and the woman had fair hearing. This case was of interest in connection with Dr. Kerrison's statement that sometimes these cases may present evidence of disturbed equilibrium after the symptoms have disappeared. In my case such disturbance remained for three years after the traumatic lesion.

Dr. Graef said that it was customary when new ideas developed to claim everything in sight to prove them. One point dwelt upon to-night, he thought, had no necessary connection with the labyrinth. He understood that Dr. Kerrison had meant to use it as an analogy to prove his case. If you

set a patient in a revolving chair and whirl him around, he will have nystagmus toward the opposite side when stopped. He understood Dr. Kerrison to say that this was an indication of disturbance in the labyrinth; this, he felt, could not be said with certainty. When turning the head around, the eyes are constantly seeking the point toward which they are turning—then, when the motion is stopped, they immediately try to right themselves and a wavering motion results for a brief time. The exact opposite will occur when the patient is turned to the left. If nystagmus is so important a symptom, we ought to make sure of its limitations. A familiar example of nystagmus of a somewhat similar type is the classical form known as "miner's nystagmus." These men develop such a condition in the eyes from the position assumed by them at work, and here, again, the labyrinth plays no part.

Dr. Davis said if you use the caloric test you do not get that.

Dr. Graef pointed out that he referred only to the turning test and had no reference to the effects produced by application of heat or cold to the ear.

Dr. Cohen said that he wished to corroborate Dr. Kerrison's test. He had seen two cases of labyrinth disease which responded favorably to Barany's tests, especially the caloric test.

Dr. Duel asked if there was complete absence of the nystagmus in the two cases operated upon, and Dr. Cohen replied in the affirmative. Dr. Alexander also uses an instrument which Dr. Kerrison had not shown, namely, a single silk-covered rubber tube (12 feet long), of which one end is placed in the patient's ear, the other end used by the physician for whisper or conversation voice; this method tests complete deafness of each ear.

Dr. Kerrison, in closing the discussion, referred to the statement of Dr. Davis that the galvanic test was useful in some cases in which the caloric test was not. Dr. Kerrison thought that the galvanic test might have corroborative value; but that so many contradictory reactions had been reported that it could not, taken alone, be relied upon as a test of vestibular irritabiltiy.

Replying to Dr. Lederman's question as to the value of the caloric test in cases of spontaneous nystagmus depending upon

brain tumors, etc., Dr. Kerrison said the caloric test would hardly be employed in such a case, its chief value being in cases in which spontaneous nystagmus was absent.

Dr. Graef had said that the nystagmus resulting from the turning or rotation experiment was a phenomenon having nothing to do with the labyrinth. This view was obviously and demonstrably erroneous. It has long been known that endolymph movements in the different canals gives rise to nystagmus, which differs in character according to the canals involved and the direction of the endolymph displacement. The rotation of a person, seated with head erect, about a vertical axis, gives rise to displacement of the endolymph in the two horizontal canals, and produces a nystagmus characteristic of this displacement.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Regular Meeting, May 14th, 1909.

Presentation of a Patient, the Subject of a Brain Abscess With Unusual Features.

DR. T. PASSMORE BERENS reported the following case: E. G., male, 32 years old, came under my care April 14th. His family history was good. Two years ago he fell, striking his chin, and became unconscious for a short time, but presented no other symptoms for at least a month, when he was seized with an epileptiform convulsion and has had infrequent seizures at irregular intervals since that time. Between four and five months ago had severe pain in the left ear, followed by discharge, which has persisted. Three weeks ago pain again developed in the left ear, and was accompanied by severe headache, localized to the left side, and a slight swelling which extended from above the left auricle well over the temporal region.

On April 3d, a simple mastoidectomy was performed by Dr. C. E. Perkins, of my staff. At the operation, the lateral sinus was found displaced forward, the bone covering it was diseased, and its removal disclosed a perisinus abscess. The limits of the abscess were reached. The wound was packed with iodoform gauze, and the patient returned to bed.

The operation was followed by great relief to the headache, and the patient did well for a few days, when the headache returned, and the swelling in the temporal region became prominent. Examination now revealed an inequality of the pupils, the right being slightly dilated. Both pupils accommodated to light and distance, and the inequality was explained by the patient's statement that they always had been unequal. The whole temporal region, from the orbit to above the auricle, was swollen and pitted deeply on pressure. There was a

profuse discharge of pus from the external auditory canal, and, following the removal of the mastoid packing, there was a profuse discharge of pus from the aditus. A diagnosis of subperiosteal abscess in the temporal fossa was made, and on April 15th the following operation was performed under ether anesthesia:

The original incision was extended by carrying it upward and forward two inches. This disclosed a large subperiosteal abscess occupying the temporal fossa. Near the anterior border of the squama was a small perforation through the bone, surrounded by an area of necrosis an inch in diameter. Through this perforation pus exuded in a steady flow, as blood does from the wound in a large vein. Its quantity was estimated to be four ounces. After the pus ceased flowing, a probe entered for an inch and a half directly inward. The necrosed bone surrounding the perforation was removed by rongeur, leaving an irregularly round opening an inch and one-quarter in diameter. The dura was not adherent to the necrosed bone, but was adherent to the surrounding healthy bone. The dura uncovered was covered with granulation tissue, and at about the center of this area was a perforation allowing the entrance of a probe to the depth of an inch and a half. At this stage the exposed dura and surrounding soft parts were thoroughly cleansed and then protected with gauze soaked in alcohol. The mastoid bone wound was then enlarged and a radical mastoid operation performed, which was prolonged on account of the extreme hardness of the bone, necessitating the use of the chisel and mallet. The roof of the antrum was intact. The roof of the tympanum had been destroyed by necrosis. The dura was adherent to the bony edges. The epitympanum was filled with granulation tissue, springing from the exposed dura, in the midst of which was a perforation leading directly into the brain, through which a half ounce of pus mixed with shreds of brain tissue exuded. A probe bent to the shape of a semicircle passed into this perforation emerged through the opening in the squamosa. Owing to the delay experienced in removing the posterior wall of the canal, when this probe was passed no pus escaped, intracranial pressure doubtless having discharged it all. A cigarette drain was passed through the perforation in the roof of the attic and brought out through the perforation in the squamosa.

The whole wound was then dressed with iodoform gauze, and the patient placed in bed in good condition.

The convalescence was rapid. The first few days there was a copious discharge of pus, with a few shreds of white brain matter, from both ends of the drain. This rapidly diminished and at the end of the first week had entirely ceased. The third day following operation, drainage was preserved by the insertion of separate cigarette drains, one through the squamosa, the other through the tegmen. These were shortened daily and entirely removed at the end of eight days. The patient sat up in ten days from the date of operation, and is now walking about the ward, fifteen days after the operation. The wound in the brain is closed and the external wound is doing well.

The following points of interest are instructive: The total absence of symptoms pointing to involvement of the central nervous system in such a large abscess in the temporosphenoidal lobe; the large subperiosteal abscess in the temporal fossa in direct communication with the abscess in the brain; the slight febrile reaction in the presence of such a vast amount of pus of streptococcic origin, for the streptococcus was the microorganism responsible, an almost pure culture being obtained; the rapid convalescence.

The direct communication of the granulation tissue in the attic with the brain forcibly emphasizes the need for extreme caution in the mechanical removal of granulations from the middle ear by way of the external auditory canal.

DISCUSSION.

DR. JOHNSON stated that the Doctor had been very successful in relieving the patient, and the progress had certainly been as rapid as could be expected. He would like to know, however, why there was an interval between the time of the original operation and the operation for the squamous necrosis. As he understood it, there was a considerable time between the operations. Another point was that there was no statement as to the condition of the sinus—no evidence of whether it retained its normal position throughout and was surrounded by the abscess, or whether it was destroyed during the progress of the disease. These cases are exceedingly interesting, and it would seem that the reason why we are getting a reasonable number of recoveries in such cases

is that the operators are proceeding with a little more freedom than they used to do and are making more complete operations. When there is a condition present that has resulted in necrosis of the various tissues, from the dura out, and possibly from the brain out, certainly the diseased tissue must be thoroughly removed—that is, up to the line of demarcation—if we expect the patient to make a recovery. In this case there seems to have been no operation on the jugular; he would like to know whether the sinus remained healthy.

Dr. McCullagh replied that the sinus remained healthy up to the time of the operation. There was a perisinus abscess. The brain abscess was in the temporosphenoidal lobe, superior to the sinus. The second operation was performed eleven days after the first. On April 3rd a simple mastoidectomy was performed and the wound packed, and this operation was followed by great relief for a few days. Then the headache returned, the swelling in the temporal region became prominent, and the other operation immediately followed this return of symptoms.

Dr. Rae said that to him the most interesting point in the case was the occurrence of two cortical perforations—one through the squama and the other through the roof of the tympanum. He thought that much of the success of the case was due to the through-and-through drainage that was obtained. The Doctor certainly was to be congratulated on the successful outcome of the case.

Presentation of Three Cases Showing Functional and Cosmetic Results After Various Mastoid Operations.

Dr. W. Sohier Bryant said of the cases presented, the first one was that of a baby 4 months old, operated upon three months ago. The child was suffering from acute middle-ear suppuration, mastoiditis and subperiosteal abscess. A simple mastoid operation and blood-clot dressing was done, with an ideal result. There was complete reorganization of the whole blood clot, resulting in immediate primary healing of the wound and drum membrane. There was no further suppuration. A barely detectable scar remained. The infection in this case was streptococcus.

In reply to an inquiry from Dr. Johnson as to the area of the bone removed, Dr. Bryant said that it was as large as a twenty-five-cent piece.

The second case was that of a girl, 22 years old, with an acute middle ear suppuration and mastoiditis. The operation was performed two months ago, and revealed a perisinus abscess and a large area of pachymeningitis. There was a great deal of osteomyelitis all the way through. The dura was exposed from the knee above to the horizontal portion below. A small area of the middle fossa and a large area of cerebellar fossa was exposed. The infection in this case was streptococcus. The blood-clot operation was performed in this case also, but the clot melted out. There was practically no suppuration following the operation. As far as the blood clot was concerned, the result was not an ideal one. However, the convalescence was more rapid (16 days) than if the wound had been packed, and the patient's hearing is excellent. The T-scar is barely detectable and the surface is even.

Dr. McCullagh said that in his cases of blood-clot operation the healing usually was complete in three weeks. In most of them there is more or less concavity, though in some few there is none at all.

Dr. Bryant said that when the blood clot fills the wound cavity thoroughly and organizes there is no concavity—not evening flattening.
even flattening. He always makes deep periosteal sutures, as well as skin sutures, in closing the wound. Otherwise the margin separates and convalescence is delayed.

The third case was that of a lad of 18 years, upon whom a radical operation was performed ten months ago. The best indications for a radical operation were present. The patient had a chronic suppuration with fetid discharge for the last six years. At the time of the operation there was an acute exacerbation with bone involvement. The result is ideal. By looking inside the ear the stapes can be seen in its normal position. The cavity was not packed, and the wound healed quickly. The hearing has remained at its present degree for six months. The patient hears a 36-inch watch at 14 inches. The postaural scar is linear and there is no deformity. Dr. Bryant said that he had never seen a case where there was good hearing after a radical operation in which the tube was closed.

Dr. Brown inquired what percentage of cases of blood-clot operation got perfectly well without any complication.

DR. BRYANT inquired just what Dr. Brown meant by complication, and Dr. Brown explained his query as referring to suppuration in any form; whereupon Dr. Bryant said that he could not answer definitely, but, speaking off-hand, certainly 50 per cent of the cases had no postoperative suppuration. The suppuration which comes on immediately after operation undoubtedly is due to faulty technic, and can be attributed to defective cleansing of the skin, or to some neglect in the dressings, in the sterilization of the instruments, hands, etc.

DR. JOHNSON asked how much time was gained in the shortening of the period required for the repair of the wound in this fifty per cent of the cases in which the clot organized, as against the packing method.

DR. BRYANT replied that it was difficult to state the comparative gain, but that, under any circumstances, with the blood-clot method, convalescence is more rapid than if the wound were packed. In the case of the baby (Case 1), the wound healed immediately. It was solid in a week. If the convalescence is complicated with suppuration, the duration of the convalescence depends upon the extension of the suppuration. When the suppuration occurs, it is usually focused in the lower angle of the wound. Such cases require about three weeks to heal. Dr. Bryant said that he has had cases where there was complete sloughing of the whole wound surface. He did not pack the wound, and the cases recovered in a comparative short time, with a very slight scar. In such cases the drainage was perfect, there being nothing to keep the pus in.

DR. BROWN said that the cases which had been presented to-night show most beautiful results, and one wishes that such might always be expected. He would like to know if these cases are a fair illustration of the results commonly obtained in New York by this method. A series of 60 cases was reported recently, of which 48 had complications of one kind or another, and of the entire 60 only 4 healed without complication.

DR. BRYANT replied that he did not know much about the results obtained in New York or Boston. He did not think that the method was very much used. Dr. Taylor, the house surgeon of the New York Eye and Ear Infirmary, has employed this blood-clot method in several operations, and his

results were about the same as those obtained by Dr. Bryant. The cases shown represent fair examples of the work he has done and of the results which can be obtained in cases without postoperative suppuration. A suppurative case will give the same final appearance as these cases, except that there will be a little more pitting at the lower part of the wound, and the convalescence will be of longer duration, though usually not much longer.

There should be no middle ear suppuration after the operation. If, however, this occurs, it can be checked with a little care.

DR. MCCULLAGH said that a point that is not emphasized in blood-clot cases, and one that should be emphasized, is that the longer a mastoid infection has existed before operation the better the chances for a successful blood-clot operation. Sprague claims that they should never be attempted unless the mastoid involvement has persisted for at least ten days, and he considers that three weeks or over is the ideal time. Dr. McCullagh said that he could not at the moment state just how many he had done, but was confident that he had over 50 per cent of successful cures without any suppuration (not absolute successes, but the posterior wound healed up and the middle ear was dry inside of three weeks). The last two cases that he had operated upon by this method were both failures, but they were both very rapid and acute cases. In one of them the patient developed a jugular thrombosis, and the jugular vein had to be resected. In the other one, which was operated upon about ten days ago, the house surgeon poured adrenalin into the wound, before Dr. McCullagh noticed what he was doing, in order to check the bleeding, and undoubtedly that had a very bad effect, for the next day, when the dressing was removed, a purulent discharge was discovered in the wound. The wound was opened up at once with a probe, and there has been no further unpleasantness in the matter. Dr. Reik, in his paper on the subject, claims that the bactericidal effect of the blood—which is more powerful in drawn blood than in blood that is circulating—is due to nuclein, and this nuclein is precipitated by alcohol, and there is little doubt that adrenalin would cause changes in the blood that might have some effect in destroying the bactericidal action of the blood in the wound. If the cases are properly selected, with a view to the

length of the duration of the inflammation, and the opsonic index or resisting power of the organism, there would be much better chances of success in these operations.

DR. BRYANT said that there was no doubt that a very acute infection does not give such good results after operation as one of longer standing. In a circumscribed infection, all the infected area can be removed; whereas an infection which has no discernible boundaries cannot be stopped as effectively.

Case of Double Mastoiditis Showing Symptoms of Intracranial Involvement. Recovery Without Opening of Cranial Cavity.

DR. LINN EMERSON reported the following case: M. B., female, age 13. First came November 23, 1908, with a history of double otitis of one week's duration. Both ears discharging. Well-marked mastoiditis, with swelling on the left side. Free double paracentesis performed, and the patient advised to enter hospital at once. Admitted to the Orange Memorial Hospital at 4:15 p. m. on the following day.

Mastoid operation performed on left side on November 25, 1908, at 3:45 p. m. Bone very hard, and but little pus or granulation found. At 8 p. m., respiration 24, pulse 120, temperature 105.4° F. Four baths were given, but temperature remained around 102° to 103° (10:30) until 12 noon, the day following operation, when it was 101.6°, after bath. Temperature did not go below 100° until 7:30 a. m. on the 28th, the third days after operation. At 4 p. m. of the same day it was 103°, and the patient had a severe chill and complained of sharp pain in the chest. Careful examination of the chest by several of the attending staff failed to reveal any physical signs of lung involvement. On the fifth day after the operation the afternoon temperature was 103°, and on the sixth day it was up to 106°, with respiration 26 and pulse 130.

Blood examination gave no Widal, no malarial organisms, and leucocytosis of 50,000.

On the seventh day the patient had a severe chill and a maximum temperature of 106.2°. During all this time the mastoid wound was frequently inspected and seemed healthy. The patient ate well, moved about, and sat up in bed; and asked each day when she might go home. At this time a

slight optic neuritis was detected in the right eye (the side opposite to the mastoid operated upon). The right ear had but a small amount of discharge, and there were no evidences of mastoiditis. After consultation with two general surgeons it was decided to open the right mastoid, in view of the oncoming right optic neuritis.

On Wednesday, December 2nd, one week from the date of the first operation, the right mastoid was opened. When the patient left the ward for the operating room, at 1 p. m., the temperature was 104.6°, pulse 128, and respiration 28. The right optic neuritis was more advanced, and beginning haziness of the margin of the left disk was now observed. The right mastoid was found sclerosed and no pus or granulations were found. The antrum was not found, and the operation was rather abruptly terminated on account of the poor condition of the patient. The patient reacted well, and the following day the highest temperature was 101°, and leucocytosis fell to 14,200. Meanwhile the double optic neuritis continued to advance, but slowly, and after two or three days it remained stationary.

The temperature stayed below 100° until the fifth day after the second operation, when the patient had another chill, and the temperature was 106.4°; leucocytosis 30,000.

The conditions were most puzzling. Both wounds looked well. The optic neuritis was slight and stationary. The patient was eating well and asking to go home, and when asked how she felt, replied "first rate." The two days following the chill the temperature was between 100° and 101° every time it was taken.

Careful watch was maintained and every precaution was made to enter the cranial cavity if more urgent symptoms supervened. The temperature, however, gradually fell to normal, and the patient left the hospital three weeks after the second operation.

A marked facial palsy, which followed the second operation, was entirely well three months later.

It is difficult to explain the high temperature, chills, leucocytosis and optic neuritis in this case, unless it was a mild case of infection of the walls of the sinus without formation of a thrombus.

DISCUSSION.

Dr. Emerson said that he would like to know if any of the men could hazard a guess as to the character of this case. There was no evidence at any time of lung involvement, cough, or anything of the kind, and he had been much puzzled by the case.

In reply to a query by Dr. McCullagh as to whether the nose had been examined as to the possibility of any trouble in the sphenoidal sinus, Dr. Emerson replied that the nose was examined only in a general way, and that no attempt had been made to probe, or to inspect the nasopharynx. It appeared perfectly healthy when she first came in.

Dr. Emerson said that four or five years before he had reported a case of an adult woman with much more typical symptoms of brain abscess, with double optic neuritis. Operation—a puncture of the temporosphenoidal lobe—failed to reveal any pus. The dura was bulging, and there was considerable serous meningitis. The patient made a rapid recovery after the operation on the skull.

Dr. Johnson said that he felt quite certain that in this case it would have been desirable to have the spinal fluid carefully examined. He felt positive that the pressure that can be exerted by the spinal fluid, even when there is no bacterial element present, and where there appears to be nothing but an increase in the spinal fluid itself, would account for a very considerable number of serious brain symptoms. The fact that there was an escape in the case of the Doctor's of a very considerable amount of the cerebrospinal fluid, with relief of the symptoms, would be an indication that intracranial pressure was the cause of the cerebrospinal condition. In the case of a person who had received a tremendous blow on the back of the head, with fracture of the occipital bone, there was a tremendous flow of cerebrospinal fluid, which subsequently gradually subsided. During the period of subsidence—there were a number of times in which the flow stopped and then began again—there were marked cerebral symptoms—during each subsidence bearing out the statement he had just made.

Sequestrum Removed From the Ear of a Child.

Dr. Rae presented this case. The child had had a profuse discharge and a facial paralysis for over a year. The seques-

trum included the inner end of the superior canal wall and the overhanging squama. In the angle between them, that is, on the "floor of the attic," the incus was lying free from all attachments. No trace of the malleus was discovered.

Report of Three Interesting Ear Cases.

Dr. J. J. Thompson: Case 1. Baby, age 8 months. Since birth the baby had been very delicate, very much emaciated, and the cervical glands on both sides were enlarged. At the age of 2 months both ears began to discharge, accompanied by a right-sided facial paralysis. This lasted about two months, when the discharge ceased and the paralysis cleared up. One month before coming under observation the discharge recommenced on the right side and the paralysis returned. This was complete. There was no temperature, no mastoid tenderness, swelling, or redness. The middle ear was completely filled with granulations, and the discharge had a very foul odor. There was no nystagmus, and as far as could be learned there had been no vomiting or tendency to vertigo.

Operation.—October 20, 1908, the radical operation was done. There was a perforation of the cortex over the antrum, the malleus and incus were not seen, and the stapes was loose in the granulations that filled the midle ear, and granulations protruded from the oval window. The external semicircular canal was open over the apex of its greatest curvature. The posterior and superior canals were now opened and the vestibule entered through the solid angle. The canal for the facial nerve was not opened, nor was the cochlea. The necrosis had exposed the carotid artery in front.

The tissue removed from the mastoid contained tubercles and giant cells. Following the operation the temperature remained around 102°, the pulse 124, there was no nystagmus present and no tendency to hold the head in any particular position. November 17 the posterior wound was closed and a plastic operation made on the canal. December 20 the patient was discharged from the hospital with the radical cavity dry, the facial paralysis still complete, and the general condition much improved. May 1, 1909, conditions were the same as on the date of discharge from the hospital.

Case 2.—Albert S., age 8 years, came to Dr. Phillip's clinic at the Manhattan Eye and Ear Hospital January 9, 1909, with

complete facial paralysis on the left side and a subperiosteal abscess over the left mastoid. He walked well, had no nystagmus, and no history of vomiting or vertigo could be obtained. No satisfactory tests of his hearing or tuning-fork tests could be obtained, and the caloric test or test for fistula were not made. The left ear had been discharging for six months and the facial paralysis had existed a month. The middle ear was filled with granulations.

Operation.—There was an extensive subperiosteal abscess, containing a large sequestrum, which included the greater part of the mastoid process, the tip and posterior canal wall as deep as the styloid process. The anterior canal wall was absent, and a cavity filled with cheesy material extended inward and forward for about one inch. When this had been cleaned out we discovered that the entire bony eustachian tube had been destroyed. The external and posterior semicircular canals were open and the entire external vestibular wall was missing, as well as the promontory, laying open the first cochlear whorl and exposing the second whorl. The cochlea was filled with discolored exudate. When this was removed cerebrospinal fluid escaped freely through the cochlea and also through the vestibule.

The patient was kept in bed a week. He had no elevation of temperature, nystagmus, or other unpleasant complication. When I placed him on the floor for the first time and asked him to walk, he went in a circle toward the left for about 30 seconds, then straightened out, and has had no sign of vertigo or difficulty in walking since. The cavity filled in well for a time, but laterally the granulations showed a tendency to break down periodically, the discharge continued from the membranous eustachian tube, and the child has since developed a general tuberculosis, with afternoon temperature, and cough, loss of weight and general weakness, so no effort has been made to close the posterior wound. In doing the dressings a fairly good-sized piece of cotton or an applicator could be passed through the eustachian tube into the pharynx.

Case 3.—This case, while not showing any involvement of the labyrinth, presented some interesting features, and I have taken the liberty of reporting it at this time. Louis S., age 8 years, was seen for the first time April 26, 1908.

In February, 1908, he had had a mastoid operation on the

right side, which had never healed. The wound presented the ordinary appearance of a fistula leading to the antrum, and the boy seemed to be in good health. There was no discharge from the tympanum.

On May 5, a little over a week after I first saw him, he had a chill and his temperature went to 104½. The next morning it was 100 3/5, pulse 100, respiration 24. He did not complain of anything, the eye grounds were clear and the wound or tympanum had not changed in appearance. That evening the temperature reached 105½, and he began to show signs of septic absorption, flushed cheeks, etc.

I decided before doing anything to wait a few days to eliminate erysipelas and exclude general conditions.

Until May 9, four days later, he ran a typical septic temperature, and did not complain of pain or any discomfort. On that day conditions were as follows: The appearance of the wound and tympanum unchanged; the chest and abdomen were normal, with the exception of a splenic enlargement; there was no headache, and he had a long chill every other day. The urine was normal, with the exception of a large amount of indican. The blood examination showed 4,200,000 red cells, 19,000 leucocytes, and hemoglobin 74%. The differential count showed 80% polymorphonuclears, 16% lymphocytes, and 7% mononuclear leucocytes. No plasmodium were present, and the Widal test was negative. A blood culture taken on this day proved to be negative. The examination of the feces did not show anything abnormal.

The chills and septic temperature continued until May 11, six days after their onset, when permission was obtained to explore the lateral sinus.

No clot was found, and very free bleeding occurred from both the torcular and cardiac ends of the sigmoid sinus. The jugular was not disturbed, and no exploration of the cerebrum or cerebellum was attempted at this time.

Next day the temperature was 105° and the pulse 118, and the patient had a chill lasting 25 minutes. He now began to complain of severe headache. The reflexes were normal, no Kernig or Babinski sign and the eye grounds were still clear. May 13 he had another chill, lasting 20 minutes, and he had a tendency to sleep a good deal, but was mentally clear when aroused. The cerebrospinal fluid was normal. May 15 he

was still running a septic temperature, ranging from 98 to 105 degrees. Blood examination on this day showed 3,000,000 red cells, 15,500 leucocytes, 65% hemoglobin. Differential count showed 73% polymorphonuclears, 24½% lymphocytes and 2½% mononuclear leucocytes, and a marked poikilocytosis.

Condition continued very much the same until May 24, when, owing to the apparent absorption of pus from some region and the rigid exclusion of other foci, it was decided, even in the absence of any marked intracranial symptoms, to explore the temporosphenoidal lobe and cerebellum. This was done, without finding any pus or other abnormal condition, with the possible exception of an increased flow of cerebrospinal fluid. From that day the boy's recovery was rapid and complete. The next day the highest temperature was 102 4/5, the following day 100 4/5, and from that practically normal. The wound healed without difficulty, and I have seen him frequently since and he continues to enjoy the best of health. The case was of great interest to me, on account of our inability to make a diagnosis and his rapid recovery after opening the dura, without finding anything to account for his symptoms and septic temperature.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Regular Meeting, October 8, 1909.

DR. ROBERT LEWIS, JR., CHAIRMAN.

PRESENTATION OF PATIENTS.

Commencing Otosclerosis—Second Stage.

DR. WM. SOHIER BRYANT presented an unmarried woman, 33 years old. Has been conscious of impaired hearing in the left ear for two weeks. The impairment in hearing is accompanied by a stuffed-up feeling and buzzing tinnitus. No history of deafness in the family.

Previous History of Patient.—Frequent severe "sick headaches." Menstruation always ahead of time.

Examination.—An overworked woman, poorly nourished. Both ears have very transparent membrana tympani. No other marked change. Palate narrow and highly arched. Nasal fossæ narrow and poorly developed.

Functional Tests.—Watch, A. D., 60/60; A. S., 10/60. Low tone limit, A. D. — 25 S. V. Low tone limit, A. S. — 98 S. V. Upper tone limit, A. D. (1.90 — .81) — 46,500. Upper tone limit, A. S. (2.10 — .81) — 45,000. Fork, 512 S. V. in medium line of head, lateralized to A. S. Fork, 196 S. V. A. S., marked bone conduction, heard for 1 m. 40 sec. Fork, 196, S. V. A. S., air conduction, heard for 1 m. 10 sec. Fork, 196, S. V. A. D., marked bone conduction, heard for 1 m. 17 sec., normal. Fork, 196, S. V. A. D., air conduction, heard for 2 m. 14 sec., normal. Gellé test, positive.

Prognosis.—Bad.

DR. BRYANT said that he considered the case one of incipient otosclerosis, not one of long standing or far advanced. The history of the case, as far as the hearing was concerned,

was inconclusive, since the patient did not realize that she had no hearing on the affected side, until she came for treatment for the relief of the tinnitus. No family history was obtainable.

DISCUSSION.

DR. DUEL inquired the age and family history of the patient, and Dr. Bryant replied that she was thirty-three years old. There was no history of heredity.

DR. DUEL said that he would doubt the diagnosis of otosclerosis in a case with such uncertain symptoms, particularly without the record of an hereditary defect. A true case of otosclerosis is likely to first manifest symptoms in early adult life; at the age when the development of the bony capsule of the labyrinth should normally cease,—from nineteen to twenty-five years. There is almost always some history of heredity—either one or both parents, or grandparents, an uncle or aunt, brother or sister, has shown a similar defect in early adult life. He would hesitate to make a diagnosis of otosclerosis after only two weeks of such indefinite symptoms in a woman thirty-three years of age.

DR. PHILLIPS agreed with Dr. Duel. He could not think of such a condition under the circumstances described by Dr. Bryant.

Symptoms of Internal Ear Suppuration With Report and Presentation of Two Cases. Operation. Recovery.

DR. JOHN MCCOY. The internal ear is invaded by suppuration as a result of acute or chronic suppuration in the middle ear and mastoid. It is frequently, however, a sequel to chronic suppuration. The infection spreads to the internal ear, either by direct extension through the oval or round windows, or along the intercommunicating blood vessels of the middle and internal ear, or by a gradual erosion of the bony capsule of the internal ear at the promontory or semicircular canals. The suppurative involvement of the internal ear may affect the cochlea alone or the vestibular apparatus alone, and the infection in each may be circumscribed or the cochlea and vestibular system may be involved together.

When the end organs of the vestibular branch of the auditory

nerve are invaded by the suppurative process, there occurs at first the symptoms of irritation of this nerve, which are vertigo and nystagmus. The nystagmus is directed toward the diseased side. As the inflammatory process progresses the end organs of the vestibular nerve lose their function in a very short time, and the spontaneous nystagmus is then directed to the opposite side. The vertigo and disturbance of equilibrium continue for several days, and the patient, unable to maintain the erect position, lies on the side toward which the nystagmus is directed, as in this way he minimizes the subjective sensations of the nystagmus. These sensations may be described as follows: If there is destruction of the right labyrinth with spontaneous nystagmus to the left, the patient in the erect position complains of vertigo, of apparent turning of objects to the left, and with eyes closed, the sensation of apparently turning of the body to the left. Rhomberg's test, however, shows that the patient really falls to the right. The patient falls opposite to the direction of the nystagmus. When looking in the direction of the nystagmus these subjective sensations become materially increased, and when looking away from the direction of the nystagmus the subjective sensations are materially minimized. Therefore the patient lies in bed on that side toward which the nystagmus is directed, because in looking up from this position he is looking opposite to the direction of the nystagmus and is decidedly more comfortable. After several days the symptoms moderate in severity, the subjective symptoms disappear, and the vertigo is only experienced when the head is turned quickly. After ten to fifteen days, if nature has thrown up a protecting barrier for the brain, the spontaneous nystagmus disappears, and the vestibular apparatus passes into a state of latent destruction. This condition can be detected by the absence of reaction to the caloric and turning tests.

If only a circumscribed portion of the vestibular apparatus is involved, the patient will at first pass through the symptoms of vestibular irritation, and later the caloric and turning tests will show a much diminished excitability of the affected labyrinth and a reaction to the fistula test. These patients are the subjects of attacks of vertigo, which may be of two types. Either the attack comes on without apparent external cause, is severe and prolonged to half an hour or more, with nystagmus during the attack; or, the vertiginous attacks may be mild and last but a few seconds and are apparently brought on by some

external factor, such as bending the head, smoking or drinking.

When suppuration attacks the cochleal branch of the auditory nerve, the symptoms are not so clearly defined. At first there comes the symptom of irritation, tinnitus, and later that of destruction, deafness. But it is not always easy to determine if the tinnitus and deafness are the result of purulent inflammation in the labyrinth or in the middle ear. The hearing tests help but little. However, if the patient, a subject of middle-ear suppuration, says that a great increase in, or complete deafness appeared suddenly, and that this was accompanied by symptoms of vestibular irritation, then if the functional tests show the vestibular apparatus to be normal, we can assume a purulent inflammation of the cochlea. If the cochleal and vestibular branches of the auditory nerve are both involved in the suppurative process, there results a combination of the symptoms just described, as produced by irritation, and destruction of each.

The ultimate diagnosis, however, must be based on the observance of these symptoms, together with the pathologic condition found at operation. In other words, the absence of deafness does not necessarily mean that the cochlea is not involved, as at operation it may be found to have a fistula leading into it, with extensive destruction, and apparently there has been good hearing. Or again, a patient with a slowly eroding cholesteatomatous process may have passed through the stage of irritation and destruction of the vestibular end organs, and the symptoms have been so slight as to have been attributed to some other cause. However, here we can rely on the tests for vestibular function to determine its condition.

In conclusion, the writer would urge in every case of chronic suppuration in the middle ear, and especially before operative procedures are undertaken, that a thorough test of the functionating condition of the cochleal and vestibular branches of the auditory nerve be made.

REPORT OF CASES.

CASE 1.—Gaetano M., male, age 25 years, occupation barber, came to the New York Eye and Ear Infirmary on April 2, 1909, and gave the following history: He has had a discharge from the left ear since childhood. On March 23, 1909, he felt as if he had taken cold, and took a Turkish bath. On March 24

rinth. On turning to the right ten times, there was absolutely he had severe headache. March 25, on awakening, he was very dizzy, could not stand up, and vomited. From March 25 to April 2, he felt more or less dizzy all the time. On entrance to the hospital, April 2, examination of the left ear showed the following condition: Membrana tympani destroyed, fundus contained granulations and foul-smelling pus. The tuning-fork was lateralized to the right, the voice was heard three feet from the ear, and the bone conduction was minus. The turning test showed right vestibular apparatus normal, left vestibular apparatus not functionating. The caloric reaction was positive in the right ear, negative in the left ear. Compression and rarefaction of the air in the left ear produced at first nystagmus toward the left side and on rarefaction toward the right. Temperature on admission was 97.4 F.; pulse, 100; respiration, 20. April 2, 1909, the radical mastoid operation was performed, thoroughly exposing the middle ear and mastoid. A fistula was found in the external semicircular canal containing granulations, and a probe passed into the fistulous opening penetrated to the vestibule. The semicircular canals were then removed and the first turn of the cochlea uncapped. The wound was packed in the usual manner and left open to dress from behind. The patient went on to recovery, epidermatization being complete in about twelve weeks.

Case 2.—Timothy H., age 6 years, was brought to the hospital on July 30, 1909, with the following history: Five days before coming to the hospital he complained of pain in the left ear and dizziness so that he could not stand when he attempted to get up. Both ears have been discharging for the past five years. The dizziness and disturbed equilibrium continued up to the time of entering the hospital. Examination, July 31, 1909. Right ear partially filled with pus, membrana tympani thickened and perforated in inferior part. Left ear contains foul-smelling pus, drum destroyed, granulations in fundus, some tip tenderness. He hears in left ear, a forced whisper at nine inches; Weber test, indefinite. Bone conduction minus. Well-marked spontaneous nystagmus to the right. An attempt at the caloric and fistula tests was made, but the child was so frightened that it was impossible to carry them out. The turning reaction he took very kindly to, and the result showed, after-nystagmus from turning to left, which lasted for 30 seconds, and which indicated a normally functionating right laby-

no after-nystagmus, which indicated disease in the left vestibular apparatus.

July 31, 1909, a radical operation was done, thoroughly exposing middle ear and mastoid, a fistulous opening of good size was found, leading into and opening both the horizontal and posterior semicircular canals and extending to the vestibule. The pus in this fistula was extremely foul, and examination of it showed pneumococci and a bacillus resembling bacillus pyocaneus. The semicircular canals were removed, and the first turn of the cochlea uncapped. The wound was packed and left open behind for dressing. Under the usual dressings the boy has progressed to recovery.

DISCUSSION.

DR. DENCH said that the account of the two cases of labyrinthine involvement were very interesting, and such work should be reported, for it was a new field. He was much interested in the development of the facial paralysis in these two cases, as one that occurs immediately after the operation and clears up so rapidly is quite rare. The cases he himself had had which developed immediately after operation always did badly. On the other hand, cases which come on twenty-four or forty-eight hours or ten days after the operation, do get well ordinarily without any trouble, so that is not a symptom of any great moment. Such a case can usually have a favorable prognosis. Dr. McCoy was to be congratulated on the results he had obtained. He was glad to hear him speak of the caloric test giving nystagmus in both directions, for there was a good deal still to be learned about this symptom. Barany's rule is almost always right. In a certain number of cases he did get a reaction that was somewhat contradictory, and he had been interested in Dr. McCoy's remarks on that subject.

Paper: Why the Failures After the Radical Mastoid?*

BY JOHN F. BARNHILL, M. D.,

INDIANAPOLIS.

DISCUSSION.

DR. GRUENING said that Dr. Barnhill had covered the whole field in his paper and had omitted nothing, and he was very

* See page 114.

glad to have heard him. All are guilty of leaving cases to the care of others. He himself had done so this year. On one occasion he had been obliged to go away and leave his cases, and though they were in skilled hands he has felt that perhaps if he had done the work himself the results might have been different. Dr. Barnhill had also mentioned cases where, in spite of everything that had been done, the result was unfavorable. It was sufficient to lower our pride, and when we speak of the radical operation we should always remember that there are many cases that we cannot cure. Dr. Barnhill had not spoken of the hearing, but only of the healing in these cases. We are often asked whether the hearing will be improved, whether it will be stationary, or finally lost. This is also an important matter. The condition may sometimes be improved, there may be no suppuration, and the case may be cured from the surgical standpoint, and yet the patient will be disappointed, for the hearing may not be so good as before. His personal experience is that when the ossicles are removed, and there is a complete healing and epidermatization, as a rule the hearing is not so good after the operation as before. That is the general rule. Some cases are improved, some remain stationary, but the majority of cases do not improve functionally.

With regard to facial paralysis, one thing is to be said. He had seen in young people, for instance, caries around the facial ridge. He has exposed the facial nerve, and seen nervous twitches there; if there is a little caries he leaves it, and does not remove everything. Nature does throw off these if we are careful in the after-treatment. It is sometimes wise to allow a little carious bone to remain around the facial nerve, and not to expose it entirely. He recalled the case of a young girl who, after the radical mastoid operation, had become engaged. Dr. Kopetzky also had seen this case. The facial nerve was exposed, and it was surrounded by a little caries, which he attempted to remove; there was some twitching, and he abstained. If he had caused a facial paralysis in this case he would have wrecked the life of the patient. We cannot always be logical and remove everything. We must consider the human and social sides of such an affair, and sometimes it is better for the patient to have a little discharge remaining, which can be treated later on. It is a great misfortune to produce facial paralysis in a young girl.

DR. DENCH said that the subject was a most interesting one, and he was glad that Dr. Barnhill had started off by saying that faulty after-care was frequently a factor in securing an unfavorable result. There is no more difficult dressing to do than that of a radical mastoid operation, and he was confident that after a man has had a large experience in that line he will shorten the time of complete epidermatization from three to four weeks by being careful. His own experience has been that most men think that after ten or twelve days it is almost impossible to infect the radical cavity. That is not so. It must be treated with respect until the epidermatization is well along. Even after a graft has taken successfully and the cavity is covered with epidermis, infection can take place and granulation tissue will form as if the cavity had not been grafted. In his practice the best results have been obtained in keeping down granulations by wiping out the cavity once a day with an alcohol solution of bichlorid 1/3000. Nothing else keeps it down so well as the alcohol with a little bichlorid in it. In private practice the hygienic surroundings are the best, and he has seen case after case where it was never necessary to use the curette or any chemical agent for removing the granulations. The alcohol and bichlorid will keep granulation tissue down, and it toughens the epithelium, and one avoids entirely the disagreeable feature of exuberant granulations.

With reference to the patency of the eustachian tube, he agreed that it was one of the most common causes of failure to heal, but he had an experience last spring which made him question whether in every instance it was wise to attempt to close the tube. In this case the eustachian tube was practically closed by the graft. Two years after, the patient had a cold, and came into his office with facial paralysis. Secretion had collected under the cicatrized grafted tissue, and as the facial nerve had been exposed at the operation, it became infected. If the eustachian tube had been open, infection under the graft would not have occurred. This was the first time he had even seen any possible danger of closing of the eustachian tube, but sometimes the closing of the tube may not be a good thing.

The size of the meatus does make a great difference as to whether or not these cases get well. He has operated successfully in a number of cases where the only mistake in the pre-

ceding operation was that the meatal opening had not been large enough. You must have a meatal opening proportionate to the size of the cavity to be drained.

The packing of a wound varies in different cases. One can use too much packing, and can pack too long. His own practice is to pack for six or seven days after the pledgets which hold the graft have been removed.

His experience did not coincide with Dr. Gruening's, that the hearing is almost always made worse by the operation. He tells the patient that if the hearing is very good before the operation, it will probably be worse after the operation. He impresses upon the patient's mind that the object of the operation is to stop the discharge, and that a possible impairment of hearing after the operative procedure may be looked for, as a necessary consequence. On the other hand, in cases where the hearing is greatly impaired and functional examination shows that the labyrinth is intact, the radical operation very frequently improves the hearing. Regarding the suggestion of Dr. Gruening, that some diseased bone might be left about the facial nerve, in cases where the nerve was exposed, as the removal of this bone might cause a facial paralysis, Dr. Dench did not agree with the suggestion. He believed that the operation should be thorough in every case, and did not think that as soon as facial twitching was observed, as the result of manipulation in the tympanic cavity, the surgeon should desist from the further removal of bone, provided this bone was diseased. The worst case of facial paralysis that he had ever seen occurred in a young man whose facial nerve was not exposed, as far as could be learned, during the operation. The anesthetist had watched the face carefully, and the face did not twitch once during the operation. When the patient came out of the anesthetic, there was complete facial paralysis.

On the other hand, he has had a number of cases where the face would twitch during the operation, and they have recovered without any facial paralysis, either immediately after the operation or later. If one is very careful and removes the bone in thin layers, it can be removed without much risk to the patient. Another point is to use the curette parallel to the nerve. The bone can be shaved off in very thin layers, and with a reasonable amount of care it is extremely improbable that the nerve will be injured.

DR. JOSEPH C. BECK (Chicago) said that he could only add his experience to that of the gentlemen who had already discussed the paper, of finding practically the same difficulty, with the healing process following the radical operation. With him, the eustachian tube was the structure giving the most trouble in obtaining a perfect result. During the past week he presented before the American Academy of Ophthalmology and Otolaryngology, in New York City, this subject of the management of the eustachian tube following the radical operation. His procedure dealing with the tubes is as follows: After locating with a blunt pointed probe the tympanic end of the tube, a long, slender, sharp curette is passed in as far as the isthmus, the mucous membrane curetted, following which the Dr. Whiting drill is employed, clearing away any possible small cells that may be located within this region. After hemostasis is established, a small skin graft is carried in as far as possible, by means of a special carrier. Against this graft is placed a small piece of gutta percha and on top of that the usual gauze pack.

There were two experiments that he has made in a limited number of cases, following the radical operation, in regard to the eustachian tube, and desired simply to mention here this evening.

First Experiment. Following the above mentioned procedure he obstructed both nares by Bernay's splints, instructing the patient not to attempt to blow the nose nor to swallow unless absolutely necessary for twenty-four hours. Patient was fed by rectal enemata, and the smallest quantities of water given, requiring as little action of the muscles of deglutition as possible. In that way the passage of air and fluid from the pharynx to the ear would be restricted and the graft given a better opportunity to adhere.

Second Experiment. After all ordinary means of closing the tube have failed, he has resorted to the resection of the mucous membrane lining the tube at the pharyngeal end. This is accomplished under local anesthesia, with firm retraction of the soft palate, by the aid of a large laryngeal mirror. The instruments employed are four small knives,which are bent in such a manner as to be easily introduced into the eustachian orifice and beyond it, making an anterior and posterior flap, which are dissected out and crushed together by a strong

artery forceps so that complete cicatrization and obliteration must take place. This experiment was done on two cases with absolute closure of the tube.

As far as the dressing of his cases was concerned, he has discontinued firm packing just as soon as the flaps were sure to be firmly adherent The gauze strips are always covered by an ointment known as Scharlach-Roth Salbe, 10 per cent. The purpose of this is to increase the time of epidermatization, as has been found in cases in general surgery.

Another point that he wished to make in this connection is his experience with the use of the burr (electric). He has found that the smoother the cavity was made the more rapid was the epidermization, especially if after the employment of the burr, a curette was used to remove small particles of bone dust from the surface.

Secondary skin grafting over such bone surfaces appeared to heal better than when the curettes alone were employed. Another point that Dr. Barnhill has referred to was the extent of the mastoid cells. A radiogram taken before the operation of the healthy as well as the diseased mastoid will be of inestimable value in not overlooking a large group of squamozygomatic cells, as well as in other regions of the mastoid. He has found in a large number of radiographs of the mastoid process a great symmetry of both mastoids, so that one can use the plate of the healthy one as a guide in operation. As to the remarks that had been made in regard to necrotic areas in the vicinity of the facial nerve, he wished to take issue with the gentlemen who would leave a diseased process to spontaneous sequester exfoliation, but he removes all necrotic bone with the greatest of care along the facial canal.

While such procedure may be followed by a facial nerve palsy, he believes that leaving the necrotic process in situ will not only defeat the purpose of the operation, but in time produce a complete facial paralysis, from which a patient will not likely recover.

Dr. Duel said that he had nothing to add to the discussion, but wished to express his gratification over the fact that so many men of large experience were now willing to stand up and narrate many different causes for their own failures in the so-called "radical mastoid operation." To him their frank admissions of occasional failure and discussion of their causes

denoted a great advance in the work. He wished to thank Dr. Barnhill for having presented to the Section so concise and complete a resumé of the subject.

Dr. Phillips said that he had had one rather interesting experience in the after-treatment of the radical mastoid operation. The patient was an unusually healthy child of twelve, who had suffered from a continuous aural discharge for six or eight years. He had performed the usual complete radical operation at the Post-Graduate Hospital. The patient was discharged from the hospital in ten days, during which time it so happened that he did not have the opportunity to follow up the after-treatment. Later he learned that there had been a persistent discharge following the operation. Some six or eight weeks following the operation, perhaps as much as ten weeks, he made a very careful examination, and discovered two shreds of gauze in the region of the mastoid antrum.. He grasped these with forceps, and pulled out a strip of the original dressing from the posterior part of the wound. To his surprise, he found a dermatization complete throughout the osseous cavity. There was an immediate cessation of the discharge, and upon testing the hearing a few days later the hearing was found to be perfect in the ear which had been operated upon. She could hear the whispered voice at a distance of twenty feet distinctly, and acumeter at thirty feet. There has been no disturbance since. It might be a good thing to leave all wounds packed for a long time, if one could thereby get such results.

He had been much interested in the remarks in regard to the complete and permanent blocking of the eustachian tube. He holds the same views himself, but wondered if any of the speakers had tested the eustachian tube six months or a year after operation to see if it remained closed. He had somewhere read that permanent closure of the eustachian tube rarely occurs—that after a time, even though the discharge stops, the tube is patulous and open. He was inclined to think that might be true after a prolonged period of time—say from six months to a year. It would be interesting to know if the cases referred to to-night could be examined to find out.

The effect upon the hearing is not the primary thought in radical operation. It is performed for the purpose of removing a necrotic process from the temporal bone, a condi-

tion which is attended by considerable danger, and its removal is the proper surgical procedure, even as it is when there is necrosis of the bones in any part of the body. In performing the radical waiting operation, we hope to get the best hearing results, but the operation primarily is for the removal of necrosed bone from a location which is more dangerous than in most parts of the body.

Dr. Kopetzky said that the discussion centered more or less upon the subject of the failures which obtained after the radical mastoid operation had been performed. If the question were discussed from another aspect, namely, judging the failures from the radical in relation to the lesions for which we operated, then there would be a different conclusion, and perhaps a solution of the question presented by Dr. Barnhill. As Dr. Phillips had remarked, in cases with necrosis, given a fair amount of care and skill in operating, and the results are usually good. In another set of cases, however, those in which the pathologic conditions presented are not bone necroses, the results are entirely different. In cases where there is a nasopharyngeal involvement, or the eustachian tube is affected, and the ear evidences a chronic purulent discharge, we have found that, pathologically, the disease is a lesion affecting the mucous membrane of the tubotympanic air spaces, and, so far as his experience went with such cases, they proved invariably the hardest to heal after radical mastoid operation. For, if a shred of the diseased membrane be left in the cavity—and there must perforce be small portions of it left, at the niches of the oval and the round windows, and in the deeper-lying parts of the tympanic orifice of the eustachian tube—then the infection spreads from these shreds and affects the new granulation tissue and the newly formed epidermis, which, becoming diseased, break down and the suppuration continues.

Besides, the disease is really a contiguous involvement, affecting the entire eustachian tube. It is such conditions as this that give the largest proportion of failures after radical mastoid operation. If it were only understood, in cases evidencing such findings as those just described, that the opening and cleansing out of the tympanomastoid cavity was only a step in their treatment, we would not look for a perfectly dry ear as a result of operation in these cases.

Then there are the specific lesions which give poor results

after operation. These cases should be eliminated when discussing our results after the operation.

Separating the specific lesions in the middle ear spaces, and the cases outlined above, the radical operation will be found successful in direct proportion to the thoroughness with which the necrosis is removed, and our failures to procure dry, clean, fully epidermatized ears will be found among the cases where there had been involvements of the mucous membrane of the middle ear spaces.

Finally, regarding technic, it is conceded that the non-closure of the eustachian tube is the cause of most failures in the cases evidencing necrosis. On the other hand, there are a set of cells along the walls of the tympanic tubal orifice which often are the seat of infection, and the suppuration from which, when they are not eviscerated at the time of operation, is construed to be a discharge from an open eustachian tube orifice, and the failure of the operation is attributed to non-closure of the tube. More attention to these cells and to the epitympanum generally obviates this origin of continued suppuration.

Dr. Gruening said that with the four points made by Dr. Whiting and Dr. Dench, it would appear that we are now in position to cure every case of chronic otorrhea. The discussion, however, did not seem to be along the lines of Dr. Barnhill's paper, but seemed to center upon the cases that can be cured. Dr. Barnhill's subject was to know why we fail. The discussion did not enter so much upon that. It was not—Why we do not fail. We all have successes, but to-night we are, and we shall always be, more interested in our failures than our successes.

Dr. Felix Cohn said that it had not been originally his intention to participate in the discussion of Dr. Barnhill's exhaustive and clear paper on the "Failures of the Radical Operation," had it not been for the remarks of the previous speaker (Dr. Gruening), who referred to the fact that the discussion had confined itself more to the technic of the radical operation rather than to Dr. Barnhill's paper; that evidently had been the case; it appears rather strange that we should still be discussing the technic of an operation which was, or was supposed to have been, perfected twenty years ago. There must be a cause for this, and the cause must be sought

either in the fact that the radical operation is not yet a perfected operation, or that—and that appears to me the most probable cause—that the Stacke operation has not always been carried out in the manner recommended by him. The radical operation was proposed in the years 1891 and 1892, and is an absolutely typical operation, as far as the osseous part of the operation is concerned. No matter how often the operation is performed, and no matter in what cases, with but rare exceptions the picture presented by the opened-up cavity at its completion is uniformly the same. No matter whether we follow Stacke or Schwartze, whether we attack the mastoid bone from the tympanic cavity, or the antrum, or in any other way—from the apex, or posterior wall—the picture presented at the completion of the operation is always identical —the inverted omega, to which Stacke referred to in his description of the operation. The sides of the omega may vary in size or in their exact relation, but upon completion we must have an absolutely similar picture, whether you operate a dozen or fifty cases. If you are careful in shaving down the spur which separates the sides of the omega, and look out for the bone ledges in the epitympanum, and likewise thoroughly level and expose the hypotympanum, the epidermis, whether grafted or supplied by plastic from the meatus, is in a favorable condition to gradually cover the osseous surface. Unless there are diseased foci or bone on the wall of the cavity, on the labyrinthine wall, or otherwise, over which epidermis cannot grow, a successful outcome must result—provided no mistakes are made in the after-treatment. A great many of the supposed failures are, therefore, really failures due to faulty technic, either in the course of the operation or in the after-treatment. Though the osseous part of the operation is a typical operation, in the after-treatment we cannot schematize, but every case must be treated individually. Tight and sectional packing, which may be excellent in one case, may cause or maintain an osteitis in another, so that frequently ordinary surgical drainage, powder treatment, or application of ointment-gauze, will produce better results than the routine treatment originally recommended. In regard to the manner of introducing epidermis in the cavity, there are various methods. Personally, the speaker has had very good results with the Stacke and Panse flaps, or with slight modifications, depending upon the individual case.

With reference to the failures of a radical operation, that a diseased labyrinthine wall, preventing a cure, cannot be considered as a failure to be attributed to the radical operation, is clear, as the typical operation does not include operations upon the labyrinthine wall, etc.; nor can we speak of failures of the radical operation in operations already complicated by intracranial lesions. Nor can we speak of failures in dealing with chronic morbid conditions of the temporal bone, due to constitutional derangements, tuberculosis, syphilis, etc. Such failures, due to necrosis of contiguous portions of the temporal bone, or to constitutional changes, are not actual failures to be ascribed to the radical operation.

In regard to the failures supposedly due to the eustachian tube, the speaker had formed no positive opinion. It is his experience, however, that in only a few of the cases can the eustachian tube be held responsible for recurring otorrheas.

There are also a number of failures, which are likewise not actual failures, inasmuch as they are dependent upon individual diathesis—the speaker refers to the so-called "epidermis relapses." If we consider that there are many individuals who normally secrete a great deal of cerumen, and that there are others who secrete very little. if any, we can readily see that the character of the epidermis must vary with the individual. In a great many cases, therefore, we find the epidermis remains absolutely normal, without even any perceptible desquamation, for years. In other cases seborrheic and eczematous conditions of the adherent and always poorly nourished epidermis may cause secondary infections, but these conditions are usually easily coped with and are only transient if treated, and cannot be considered as failures.

Dr. Gruening has frequently in his discussions referred to facial paralysis occurring in the course of the radical operation. As one of the causes, he had made reference to necrotic areas near the facial. While it is possible that on very rare occasions these conditions might cause facial paralysis, such lesions are comparatively rare, and it is more likely that facial paralysis is due to other causes—the most frequent cause, some error in technic. Formerly facial paralyses were much more frequently reported; they occur less frequently now, simply because the individual operators have gradually improved their technic. As a great many otolo-

gists, instead of following the methods laid down by Stacke, evolved their own technic, or followed other methods, it was natural that their results at first were not equal to those obtained by them after a more intimate acquaintance with the technic of the radical operation. Stacke especially recommended the typical operation, and developed the method solely for the purpose of preventing facial paralysis, and it was not uncommon for those visiting the clinic of Schwartze, for example, as far back as 1893, 1894 and 1895, to see twenty and thirty cases of radical operations under treatment without a single facial paralysis. That occasionally a facial paralysis may occur is true; it may occur at any time, and any one; but too many facial paralyses are due to some error in the technic of the individual operator in not adhering closely to the method as originally laid down by Stacke. It is the opinion of the speaker that in the consideration of the radical operation we should omit entirely in our discussions all reference to the occurrence of facial paralysis, and especially in our recommendation of this most important operation to our patients. The occurrence of facial paralysis must simply be considered a rare accident, similar to occasional accidents which occur in operations about other parts of the body.

Dr. Barnhill, in closing the discussion, remarked that there was very little to be added. The paper had been very thoroughly discussed, and with that discussion he agreed in the main. Concerning the eustachian tube, he believed that most men who operate believe this to be the cause of the majority of failures. He was somewhat disappointed in that one assertion he had made in the paper was not at least moderately assailed. Perhaps it was not understood—it was to the effect that if the pharyngeal end of the tube is put in a thoroughly aseptic condition and freed from obstruction, the patency of the tube itself was not so harmful as it is thought to be. Notwithstanding his belief that this assertion is true, he tries to give the same care in assuring closure of the tube that had been asserted to be necessary by those who had spoken in the most radical way. He cannot get away from the belief that there is a relation between the pharyngeal end of the tube and the continued aural discharge after operation. As he had stated in the paper, should we operate on a case of frontal sinus suppuration in which there is a complicating in-

fection of the anterior ethmoid cells, but do not eradicate the disease in these cells and in the infundibulum, failure to cure may be expected. The condition present in chronic suppuration of the temporal bone is somewhat similar, in that the most thorough operation on the mastoid will fail to cure if there are infected structures in the nasopharynx which are not thoroughly dealt with at the same time. At least in was true in his experience that if he did not get rid of any diseased nasopharyngeal condition his efforts to complete the closure of the tube were not always successful. One is apt to overlook the fact, with which all are familiar, namely, that the nasopharynx is undoubtedly a part of the auditory apparatus, at least when it comes to diseases of the ear and to the radical operation on the ear. We should never forget that the original cause of the trouble for which we operate entered the middle ear and mastoid through the eustachian tube, and if we propose to reverse the process without trying to get rid of the cause of the disease we are proceeding in a backward manner.

As to the effect on the hearing, mentioned by Dr. Gruening, in relation to the radical operation, it was the speaker's opinion that this was not an operation intended to improve the hearing. It is intended to eradicate a suppurative condition of the bone and its environment. That condition is a danger to the life of the individual which it is highly desirable he should be rid of. His experience was that the hearing was little, if any, improved; but he usually states to the patient that it is not likely to be more seriously impaired.

Probably all agreed with what Dr. Whiting had said in regard to removing the epitympanic walls. There is no question about the necessity for thoroughness here. He had said in his paper that the epidermal tissue will not climb osseous walls or descend into trenches left in the bone by the operator. The entire tympanic cavity must be put in a smooth condition and left free from all necrosis, and if that is done thoroughly, as he had seen it done here in New York recently; if the operation is followed by proper after-care; and if the patient has no diathesis of any serious kind, one may in all reason expect the case to get well. In most cases there is a warfare between our fear of doing the patient more damage than good, a fear of leveling down the facial ridge to the proper plane, or a fear

of severe hemorrhage from going into the deep cells of the eustachian tube. While there is this warfare between doing too little and doing what we know ought to be done, if we go as far as we should; if efficient care for the wound that is made is given, and if the patient is in good physical condition, the radical operation is no doubt as often successful as is other major surgical procedures.

NEW YORK OTOLOGICAL SOCIETY.

Stated Meeting, Held May 25, 1909.

DR. JOHN L. ADAMS IN THE CHAIR.

Specimen Showing Infection Through Internal Auditory Meatus.

DR. ARTHUR B. DUEL said that he wished to present a specimen removed from a case that he had recently operated on, which presented symptoms of sufficient interest to make it worth while to call to the attention of the Society. The patient was a young nurse in the Manhattan Hospital, and first came to the clinic because of pain in her ear and noises in her head. Upon examination the drum membrane was found to be translucent and somewhat retracted. She had a "tender" mastoid and she complained of some pain in that region. Inasmuch as she was a young and impressionable nurse, and had seen many serious mastoid cases, he had largely disregarded the symptoms of mastoid tenderness. The house surgeon had seen her previously for the same symptoms, and with the same retraction of the drum membrane, and he had inflated the middle ear by catheter. Dr. Duel did the same thing. She had a tubal catarrh, and the pain seemed referable to the retraction of the drum membrane. With the inflation there were no evidences of fluid in the middle ear. She was told to report back to the clinic in two days. In the meantime the ear was inflated by the house surgeon on the following day. The next day they telephoned Dr. Duel that she had marked pain and that the drum membrane was slightly bulging, and advised a myringotomy. He was told that following the incision a viscid fluid escaped. When he saw her that same afternoon the drum membrane was retracted and she still had some pain. There was no fluid escaping from the middle ear. She still had mastoid tenderness and complained of pain over the mastoid. She had no temperature. She remained in bed on a light diet. For the next two days there was no evidence of fluid in the middle ear. Dr Duel left town that day, but told his assistant to look after her, and assured her that she had no mastoiditis.

However, on the following day a thin, yellowish discharge came from the middle ear, and she developed some temperature. On the following day the symptoms increased to such an extent that operation was advised. Dr. Duel returned on Monday morning, and finding that she had definite symptoms, with temperature, told her that he must retract what he said before going away, and that she should be operated on that same afternoon. She had a very thin cortex and the mastoid was a pneumatic one. The cells were filled with pus, granulations and necrotic tissue; it appeared as if a hemorrhage had occurred in the mastoid and that the clots had partially broken down. On the morning following the operation it was reported to him that she had been vomiting frequently during the night. She was extremely dizzy. Dr. Duel at once saw her and found on examination that she had a violent nystagmus away from the operated side; on looking away from the operated side this was increased; looking up caused a screw-like motion of the eye. She was made dizzy when she moved in bed, particularly when the wounded side was up. These symptoms continued for forty-eight hours. In the meantime Dr. Duel called in consultation several surgeons in the hospital to show the interesting symptoms, and also to get an expression of feeling whether it would be wise to operate upon her for labyrinthitis. Inasmuch as she did not have a very high temperature, and as he had seen many similar cases before they knew so much about nystagmus, dizziness, etc., they decided that they would not operate. Within forty-eight hours the nystagmus and other movements had practically disappeared and she was perfectly rational, with no evidences of mental fogging. She then developed a temperature of 106. That afternoon spinal puncture was made by Dr. Zabriskie, but it was a "dry tap"; only one drop of fluid was obtained from the spinal canal. After consultation with Dr. McKernon and Dr. Kerrison, they decided that the only thing to do was to operate, which he did. He entered the labyrinth posteriorly. Throughout the labyrinth was found pus and granulation tissue, similar to that found in the mastoid. As shown by the chart, the temperature came down gradually for twelve hours following the operation to 103.2. A few hours later she suddenly developed a higher temperature, 106, then 107, and during the last four or five hours before death she was unconscious.

The specimen was a very beautiful one, showing the method of entrance of the infection directly through internal auditory meatus along the course of the seventh and eighth cranial nerves. The color was well preserved and showed the exudate along these nerves and at the base. There was present a diffuse leptomeningitis.

DR. JOSEPH A. KENEFICK asked what was the nature of the infection.

DR. DUEL replied that the first smears taken from the ear showed a mixed variety, but that later smears showed streptococci; the blood cultures showed streptococcemia. The leucocyte count was about 24,000, with a polymorphonuclear percentage of 87 per cent. No tuning-fork test was made.

DR. HARRIS asked if there was at the time of operation any indication of any involvement of the inner wall.

DR. DUEL replied, not at all. The petrous portion laid out in the wound very prominently; the cortex was of ivory-like hardness, and it would have been very easy to see any opening there.

DR. HARRIS asked if any fistula was discoverable at the time of the second operation.

DR. DUEL replied that at the time of the first operation the middle ear had not been invaded. But in the second operation the facial nerve was apparently exposed. Touching the granulations in the middle ear caused repeated muscular twitchings of the face. The facial nerve was exposed posteriorly in the operation; the twitchings were not from touching this point, but apparently from touching the granulations in and about the oval window.

DR. GRUENING asked if the sinus was opened at the autopsy.

DR. DUEL replied that it was, but nothing was found. The sinus wall appeared healthy.

DR. GRUENING said that all cases of meningitis were complicated by bacteremia. He asked Dr. Duel if the infection could be traced from the labyrinth into the brain.

DR. DUEL replied that it could be traced directly along the course of the seventh and eighth cranial nerves. The vestibule and semicircular canals contained a thin grumous mass of granulations and pus.

Dr. Frederick Whiting presented some

Instruments for the Removal of the Labyrinth, Semicircular Canal, Vestibule and Cochlea.

He had used them a great deal during the past winter and with satisfaction. They consisted of a form of gouge, forward bent and so arranged that after the mastoid had been removed, one could rapidly remove with them the semicircular canals. Under favorable conditions one could remove the semicircular canals very quickly indeed.

In addition, he showed some chisels which worked very nicely, both for removing the semicircular canals and for opening the vestibule widely, allowing one to get below the facial ridge.

For the removal of the cochlea it seemed to Dr. Whiting that the instruments worked very excellently.

He presented a retractor which, for want of a better name, he called the "claw-hammer retractor," which was for use both as an ordinary retractor in ordinary radical operation and in the labyrinthian operation. The retractor contained an eye in the back through which an ordinary piece of gauze was passed; this wick of gauze was drawn from below up through the meatus in such a way as to invaginate the fibrocartilaginous meatus upon itself. This drew the orifice directly upwards; the circular portion of the fibrocartilaginous meatus was held up out of the way. Care should be used not to allow the loop of fibrocartilaginous meatus to protrude downward into the bony meatus, where it would obscure vision. With that appliance the circular portion of the fibrocartilaginous meatus was invaginated; when drawn upon, it held the meatus out of the way. The claw-hammer portion of the retractor was malleable and held the large anterior flap well out of the way. It allowed one to have an admirable view of the operative field. The retractors were very simple, and in the cases he had used them he had found them very satisfactory.

Dr. Gruening said he had had the privilege of seeing Dr. Whiting work with the instruments presented, and he thought that the claims made for them were good. He never saw such an exposure as he got with the retractor. He found that the gouge worked without difficulty. In a very short time he laid the labyrinth bare, and the chisel used was adapted to the size

of the semicircular canals and of the promontory. He believed these instruments to be useful in advanced work. He asked who made them.

DR. WHITING replied that Mr. Ford made them for him.

DR. DUEL asked if he freed the anterior part of the cartilaginous canal.

DR. WHITING replied that one could use the instruments without freeing it, but it was better to free it in order to get a better exposure. It gave an admirable view of the operative field when it was freed. He had never seen anything occur disadvantageous when it was freed.

DR. DUEL had thought it was best, in the radical operation, not to free the anterior part of the cartilaginous canal, subsequent treatment being easier and healing taking place more rapidly. In labyrinth exenteration one naturally wanted all the space that it was possible to obtain.

Mastoid Operation Followed by Joint Pains.

DR. STEPHEN HENRY LUTZ presented an interesting case. This patient had been operated upon for mastoiditis two weeks ago yesterday, after having had the trouble for a little over one week. He saw the woman Wednesday, three weeks ago to-morrow, and then advised operation. She had been sick two or three days then. She lived out of the city. Two weeks ago yesterday she was operated on, and she did nicely for four days, when she had a little rise in temperature. The only thing he could note was a badly coated tongue. Her condition became worse. She had swelling under one eye on the same side that she was operated on, but this went down the following day. The urinary examination was negative, except for some epithelial cells, but no casts. Her temperature kept going up. About the fifth, sixth and seventh day after the operation she had extreme pain in the hip on the same side she was operated on; two days later she had pain in the other hip. There was no swelling or redness; just this pain. There was extreme sensitiveness to pressure. A blood culture was made, but showed nothing. One joint after another became involved. She was given aspirin 5 gr. every two hours, and then the temperature came down readily. From this time on, buttermilk was her sole diet for one week and the tongue and intestinal canal cleared up rapidly, and she had no more

trouble, and she was walking outdoors in less than three weeks after operation.

Meningitis.

DR. JOHN E. SHEPPARD reported the case of a child of seven years who was sent to him at the hospital for operation, with a diagnosis of lateral sinus trouble. The history given was that the patient had had scarlet fever eight or nine weeks previous to the time he first saw her. She had running ears, which ceased in about three weeks. There were no evidences of any complication at that time, so far as could be learned. Her temperature was high during her attack of scarlet fever, but soon went to the normal. She then ran a series of temperatures, running from 104° up, lasting three or four days, when it would return to normal again. After about a two weeks' interval with a normal temperature, the temperature again went up rather gradually to 101° or 102° and lasted for two or three days. At that time a neurologist saw the patient and made up his mind that this was a case of a fresh focus of sepsis, because of the three periods of elevated temperature. Lateral sinus trouble was diagnosticated, and the patient was sent to the hospital.

Dr. Sheppard saw the patient and found the drum membrane normal. Both mastoids were tender, one more so than the other. He did not attach much weight to this symptom, because the child was irritable and very fussy. No blood cultures had been previously taken, and the one asked for then showed nothing. The white blood count showed about 8,000 and a polymorphonuclear percentage of 67. In the spinal fluid were found streptococci. The pupils were moderately dilated and equal in size, but sluggishly responsive to light. The knees were drawn up and firmly flexed. He declined to operate, but kept the patient under close observation. The temperature ran from 101° to 103°. The patient was taken from the hospital, and Dr. Sheppard understands that she has since died. The neurologist took him severely to task for not operating.

He did not like to operate upon meningitis cases after spinal puncture has resulted in the escape of cloudy fluid. It was interesting to note that this neurologist assured him that there was in this case a hydrocephalus—the head having grown a little more than 1 cm. between his two visits.

Lateral Sinus and Jugular Thrombosis With Removal of Entire Jugular.

DR. FRANCIS J. QUINLAN reported the case of a man, forty years old, who was sent to St. Vincent's Hospital seven years ago. He entered with pain over the ear, which radiated to the mastoid. An examination of the drum membrane revealed some slight injection along the hammer; there was no bulging or sagging posteriorly or superiorly. The pain continued with great severity and prevented him from sleeping. Irrigations were given every two hours. At the end of two weeks he was still in the same condition. The blood count showed 8,000 white cells and a 74 per cent polymorphonuclears. The patient had no temperature. The pulse ranged from 80 to 90. The objective symptoms were somewhat negative. From what was presented by the patient, he thought there might be some mischief in the sinus, and the man was prepared for operation.

There was a very hard cortex. When the outer table was removed he found that he had to deal with some pus and a great deal of granulation tissue. After cleaning this out the sinus was investigated; this seemed reddened and had a peculiar yellowish-white, dirty look. Upon further exploration he found a solid mass. He endeavored to establish the circulation, which he found rather difficult, although he succeeded. Below the bulb he found a hard, fibrous mass. The jugular vein was removed in its entirety, and the patient made an uneventful recovery. The incision in the neck, which was necessitated, left a very small scar, and the mastoid opening closed nicely. There was no discharge.

This case presented several peculiar aspects. Except for the intense pain, there was nothing to account for the hidden mischief. There was some edema, but there was no temperature which might show absorption. Nothing was to be found in the blood examination. This was what he termed a hypothetical case, one that ran from the traditional lines in cases of this kind.

DR. EDWARD B. DENCH asked if he understood Dr. Quinlan to say that there was a discharge from the ear.

DR. QUINLAN replied that there had been none at all.

DR. DENCH asked if there had been a previous history of discharge from the ear.

DR. QUINLAN replied, none whatever. There was nothing but this intense pain. It looked at first as if the woman was neurotic, in the absence of other symptoms.

DR. DENCH said that sinus trouble was probably present, but there was no clot.

DR. QUINLAN said that the sinus was obliterated by one large thrombus. There was one solid mass of fibrous structure.

DR. DENCH asked if there was any clot at all.

DR. QUINLAN replied that there was none.

DR. DENCH said that he had met with several similar conditions, with a history of no discharge. He thought that there were a certain number of cases where the obliteration of the lateral sinus was a protective measure on the part of nature.

DR. QUINLAN said that the circulation below was not entirely stopped. Smears made from the granulation tissue showed chains of streptococci.

DR. DENCH asked if the same was shown in smears taken from the mastoid.

DR. QUINLAN replied in the affirmative. The patient denied ever having had any trouble with her ear in her life.

DR. JOHN E. SHEPPARD asked how long had pain existed in that ear.

DR. QUINLAN replied, one week.

DR. JOHN L. ADAMS asked how long the patient had been under observation before the operation was performed.

DR. QUINLAN replied that the patient had been in the hospital two weeks, and she had complained for one week before entering.

DR. ADAMS asked if there had been any temperature before that.

DR. QUINLAN replied that he could not tell. She had an abnormal pulse, never being over 85.

DR. DENCH said that the case seemed interesting to him because it showed the existence of a certain number of cases with suppuration in the mastoid, where the sinus may be shut off by a nonseptic clot, exactly as in epidural abscesses, localized collections of pus, with no involvement of the general meningeal spaces, occur. This case was certainly a unique observation, so far as the temperature was concerned, and he had never seen anything like it. He had a case in mind, a man

whom he had operated upon early, but in this instance there was a history of a discharge from the ear. A similar condition was found in the sinus. He operated on the sinus and also tied the jugular. This man made a perfect recovery. If the sinus was apparently closed in these cases, he said he was inclined to let the jugular alone. If the sinus was obliterated, there was no chance for absorption to take place. If symptoms occurred, they were an indication that absorption was taking place.

Dr. Stephen H. Lutz said that he had met with the condition twice. Both gave a history of old running ears. In one case he tied the jugular, and the case recovered. In the second case, one week ago, the patient had a hard white cord in the jugular, with a small perisinus abscess. This old organized clot seemed completely to obstruct the sinus, but the sinus looked healthy above and below the thrombus, so the jugular was not tied in this case, and the patient made a rapid recovery.

Dr. Wendell C. Phillips said he did not grasp Dr. Quinlan's statement regarding the temperature.

Dr. Quinlan said that there was no rise in temperature.

Dr. Phillips said that in those cases of the type described by Dr. Quinlan, they should try to eliminate carefully the possibility of some syphilitic trouble in the mastoid region, or some other disease of that type. The history of the case pointed strongly in that direction. He thought there had been a tertiary manifestation of syphilis in the mastoid region. There might have been a broken down gumma.

Dr. Duel asked how streptococci in the granulations and pus could be accounted for.

Dr. Gruening said he had seen such conditions, but not in cases giving the history that Dr. Quinlan gave. All the cases had long-standing ear disease. He had never seen such a sinus. He had cases presenting this hard white cord-like structure; some died and some got well.

Dr. Phillips said that one never saw a condition of the kind described by Dr. Quinlan, with the drum membrane not broken.

Dr. Quinlan said that there was a small drop, a tiny bit, of mucoid rather than purulent material in the tip of the mastoid.

DR. SHEPPARD called to mind a case he saw a number of years ago. A man was sent from the jail to the hospital for observation. He had no running ears. He had middle-ear inflammation and mastoid tenderness. The mastoid was opened, and the entire lateral sinus was found obliterated. Nothing further was done to the sinus. An abscess in the cerebellum was found and opened. The patient died, and at autopsy it was shown that another abscess existed, which had not been found, and had caused the man's death. It seemed to him that in cases of that kind it was unnecessary to go down to the jugular unless septic symptoms arose.

DR. DUEL said that an interesting point arose as to how the infection had occurred in the mastoid; either it must be that the infection had taken place through the blood current, without involving the middle ear, or else one must admit a middle-ear inflammation. He did not think it was at all impossible for the infection to travel through the eustachian tube to the middle ear and so involve the mastoid without showing any visible signs of trouble in the middle ear. This was particularly so in those cases where pain in the ear had occurred some days prior to when first seen. There might have been an inflammation present just sufficient to cause congestion of the drum membrane, passing on to the mastoid, without causing an abscess in the tympanum. This, he thought, might be a rational explanation of the source of invasion.

DR. THOMAS J. HARRIS said he had no doubt but that they all would accept the theory Dr. Duel advanced; it was not merely a possibility, but he was sure that infection occurred this way in a certain number of cases. It was pretty well accepted on the other hand that this did take place in a certain percentage of the cases.

DR. DUEL said that in the case of the specimen previously shown, there were no early evidences of middle-ear infection at all. The patient had been under observation for many days. There had been a clear drum membrane with some retraction for a time. Nevertheless, when the mastoid was entered, after four or five days, there were evidences that there had been infection present from the onset.

DR. QUINLAN said that he forgot to add that in the section removed the pathologist found streptococci present.

DR. DENCH asked if the streptococci were found in the walls of the veins.

DR. QUINLAN replied that the pathologist said that the streptococci were found in the specimen; he did not say that they were found in the walls of the veins.

DR. DENCH asked if there was any clot in the vein when taken out.

DR. QUINLAN said that it was like a piece of twisted twine exaggerated. It was a white cord, which became thicker and thicker as one came down. He could not map out the veins or clots; they were so agglutinated that it was impossible to separate one from the other.

DR. DENCH said that germs were frequently found in the walls of veins, although one may find perfectly healthy clot in the veins. Streptococci were frequently found in the walls of veins, probably getting there through the vasa vasorum more readily than through the general circulation.

Wound of Subclavian Vein During Operation.

DR. WENDELL C. PHILLIPS made a report of an unhappy event which occurred during an operation, a resection of the jugular vein. The case had already been reported at one of the meetings of the L. B. O. Society this winter. Dr. T. was working with him. In their efforts to proceed rapidly both were working in the wound. The subclavian vein was wounded at the point where the jugular vein entered. The hemorrhage, of course, was terrific. He reported this case in order to show how he was able to control the hemorrhage. Immediately strips were passed down into the mediastinum, pressed against the wounded vein, and held there until the proper packing could be attended to. Not being sure of his first packing, he withdrew it, and this was followed by another hemorrhage, but the patient did not lose much blood. He then packed very tightly. After about four days he took out the packing, and there was no recurrence of the bleeding. He gave immediately an intravenous saline injection. The accident did not have a deleterious effect on the outcome of the case. The case was known to be a fatal case, anyway. The patient lived three weeks after the accident.

Pus in Mastoid Resembling Injected Paraffin in Appearance.

DR. PHILLIPS reported another case which he said he would like merely to mention because he intended to report it more

fully and intelligently in the fall. This patient, a man, was seen at the Post-Graduate Hospital one week ago Sunday. The patient was a large, robust man, weighing probably 225 pounds, and was an engineer on a locomotive. He gave the history that for two months he had had severe pain over the mastoid. There had been no discharge of pus from the middle ear and no rupture of the drum membrane. An incision was made into the drum membrane, which was followed by a slight discharge of pus. There was no tenderness on pressure, according to the report; there had been no tenderness over the mastoid. Pain had been his chief symptom. On admission to the hospital very slight tenderness could be elicited over the mastoid. He was compelled to give up his work on account of the mastoid pain. One morning he started to vomit, and vomited during the entire day. When Dr. Phillips saw him on Saturday he was rather ashen in color and appeared to be in collapse. His mental condition was not bad, and he answered questions intelligently. There was this continuous vomiting, with not much rise in the temperature, a history of pain in the mastoid, a slight discharge from the ear, with not a great deal of bulging of the drum membrane or the posterior superior canal wall. The man was prepared for operation. The blood examination showed about a 92 per cent polymorphonuclear count. The leucocyte count was from 10,000 to 17,000. The patient rapidly became delirious and could be restrained with difficulty. The house surgeon, without being directed to do so, gave the patient a quarter of a grain of morphin hypodermically. Whether he gave anything else than morphin he could not state. Dr. Phillips was telephoned to and told them to prepare for operation. About 11 o'clock the man was unconscious, whether from the morphin, the middle-ear disease, or a combination of both, he could not tell. He had, however, many misgivings about the administration of morphin at that time. Ether was given by an experienced anesthetist. Upon removing the cortex it was evident that there was very extensive disease in the mastoid. The pus, which was very offensive in odor, did not well up on pressure. Dr. Phillips had never seen a similar condition in the mastoid. It appeared as if the cells had coalesced together. If one could imagine a mastoid with large cells injected with paraffin, he would get an idea of the condition found. It cut like cheese. When he came to the work on the sinus and was proceeding with the excavation,

the blood became very dark in color. Respiration began to get slower and slower all the time, and he was obliged to discontinue the operation and devote his attention to resuscitating the patient. There was no response, and respirations could not be revived. He dilated the sphincter ani, and he did everything that was usually done in such cases, but the respirations would not come up, and the patient died within five or ten minutes, on the table. He was so near the sinus, excavating high up through the antrum, he thought he would continue operating quickly upon the sinus after death. There was no disease in the sinus, but on passing a probe through the attic wall into the cranial cavity, and withdrawing it, there followed a flow of pus. He said he felt quite suspicious, from the character of the granulation tissue, that this might be a malignant case. But a careful examination made of the scrapings gave no such evidence.

DR. DENCH said that three years ago he reported three cases of that character, and he recalled two of these cases distinctly. The entire mastoid process contained masses that looked like paraffin. On examination, these masses were found to consist of cholesterin.

DR. PHILLIPS said that the case he reported was one of chronic suppuration. There was no history of any discharge previous to two months ago. The odor after the part was opened was not that which would be expected in cholesteatoma cases.

DR. DENCH said that they all knew how unreliable the histories given by patients were. Early there might have been a suppurative process followed by cicatrization, and the cholesteatoma might have resulted as a result.

DR. GRUENING, referring to the first case Dr. Phillips reported, said he would like to know whether the treatment on cases of this kind, where the subclavian was injured, or in cases where the jugular vein was injured and the end could not be gotten at, could not be carried on wisely by going further and exposing the subclavian vein thoroughly and tying it. One must use a great deal of material to effect a compression of the subclavian vein at that point. He thought it would be better to expose the subclavian vein and ligate it; that would be the proper treatment.

DR. ADAMS asked Dr. Phillips if he had much trouble in

making sufficient compression there, and when taking out the packing, what happened.

Dr. Phillips was unable to say whether the injury was exactly in the subclavian where the jugular emptied into it, or not. They were working well behind the clavicle and working as low as was possible. The injury took place and the flow of blood was tremendous.

Dr. Adams recalled the case of a Greek who had an operation performed for sarcoma of the neck, and the jugular vein was injured at the time. The man died on the table. Soon after that an operation was done upon a man connected with the institution, and the same thing was done, and that man died on the table. He did not see how any packing could be effectual in controlling such a hemorrhage in the throat. He thought that possibly air might get through the packings.

Dr. Phillips said he never saw such a collapse occur as in the patient he reported, and he knew that he saved the boy's life by quick work and by the use of the intravenous injection of normal saline solution. He lived three weeks after the accident.

Dr. Gruening thought that the supposed danger from the entrance of air into the veins was a bugbear.

Dr. Dench said that several years ago several cases were reported and published of the entrance of air into the lateral sinus. He thought there were one or two such fatal cases published.

Dr. Gruening thought that such cases must be very rare.

Dr. Dench replied that they were indeed rare.

Dr. Phillips asked if any present had had such an accident happen.

Dr. John D. Richards said that he had such an instance happen to him; the vessel was seized with an ordinary clamp and twisted. This controlled the hemorrhage.

With regard to the entrance of air into the jugular vein, one and a half years ago he had a case in which there was an extension of the disease far down below the clavicle, and it was impossible to get to the lower limit of it, so he cut the jugular off below the clavicle. He took a pair of mouse-toothed forceps and introduced them below that point and got out a lot of clot. During the manipulation there was an aspiration of air, whistling in and out. Subsequently at the dressing the same thing occurred.

DR. QUINLAN said that some time ago, in Phalidelphia, an experimenter forced an unusual quantity of air into the femoral vein of a monkey with no effect whatever.

DR. DENCH said he saw a case last summer in which he assisted another do an operation in which the lateral sinus was wounded. In that particular case aspiration was heard and respiration stopped. The man, however, was alive to-day. Dr. Dench said that he had opened the sinus many times accidentally and intentionally for the purpose of exploration.

DR. ADAMS said the case he reported was one of sarcoma of the neck, and the lumen of the vessel was wide open.

DR. DENCH said he had torn the jugular vein several times and had never seen any ill results from this accident. In one instance the jugular vein was divided between two ligatures, and the lower one slipped off and nothing happened.

So far as packing to control the circulation there, he did not see why packing down on the first rib would not stop any venous hemorrhage there.

DR. GRUENING, referring to the case reported by Dr. Sheppard, said that the question now was, "Where do we stand?" Should we stand by and not do anything in cases of otitic meningitis? He said he had had similar cases. Streptococci were found in the cerebrospinal fluid. He cut down and drew off a great deal of water from the subarachnoid space, and the child got well. There were a number of such cases reported. He did not think we should be silent on this question. He asked for an expression of opinion.

DR. DENCH said that he was much interested in the subject of meningitis. If one took one hundred cases of otitic meningitis at random, forty-five would get well as the result of operation. Leaving out the cases of localized meningitis and epidural abscesses which always get well, there were a number of cases in which the subdural spaces were drained, lumbar puncture having been done, the purulent fluid evacuated, and the cases recovered.

Dr. Dench had seen a number of cases this winter, and every one of them were operated on. There were two cases where he drained the subdural space. In two cases he drained the ventricles. He had a case only last week in which the ventricles were drained. He did a lumbar puncture and later drained the lateral ventricle. The patient lived six days after

drainage was instituted. This operation should be done with strict observance of proper technic. This was an absolutely new field of work. The cases should be divided into two classes, one where the ventricles are involved, the other where the subdural space is involved. The latter cases should do well in every instance.

He was glad that Dr. Gruening brought this question up. He did not believe that these patients should be allowed to die without operative interference.

DR. GRUENING said that he had recently seen reported cases that had been diagnosed as meningitis and nothing had been done.

DR. SHEPPARD said that he had had three or four cases of serous meningitis in which he operated with recoveries. But in those cases in which the cerebrospinal fluid is distinctly cloudy, he confesses that he feels pretty helpless. Most cases of serous meningitis, however, will do well. He asked Dr. Gruening if he had found streptococci in the serous meningitis cases.

DR. GRUENING replied that he had found such an instance but once; streptococci were found in the cerebrospinal fluid in that case. They also would find streptococci in the cerebrospinal fluid in cases where there was no meningitis. There might be an epidural abscess. He thought that in those cases with very severe symptoms, the cerebrospinal fluid would show streptococci in abundance. In some cases operation was refused because the condition was caused by the streptococci.

DR. DUEL said that Balance had spoken of the hopeful position even in those cases where the cerebrospinal fluid was found to be milky and to contain bacteria. This was in line with what Dr. Dench had said. There was a possibility of differentiating different types. The future looked bright for saving cases that now were lost, from want of activity on the part of the surgeon.

DR. PHILLIPS was positive that they should not allow patients to die without making an effort to save them. One or two cases in his service at the Manhattan Eye and Ear Hospital had recovered after operative interference. He thought they should improve their technic. In one of his operations he knew that his technic was bad, but he did better with his next case.

DR. WHITING said that the symptoms must be very pronounced before he would abstain from operation and allow the patient to die without operation.

DR. RICHARDS said he had seen one case that recovered; the cerebrospinal fluid was not examined, but the subdural spaces were, and pus was obtained.

DR. HARRIS said he had had a limited experience with these cases, but he felt, as did Dr. Gruening, particularly after he had read with care an article by Alexander, who took the position of most of those who had spoken. This, however, was not the position assumed by Dr. Sheppard, namely, that operation was indicated when a diagnosis could be made of serous meningitis. Not only in serous but in purulent meningitis operative interference was indicated. He took the position that Dr. Gruening did, that the findings in the cerebrospinal fluid were contradictory. In the presence of turbidity or pus in the cerebrospinal fluid, unless there was some sufficient reason not to operate, he did not believe this to be a contraindication for entering the cranial cavity.

DR. DENCH said that in one of his cases he did a lumbar puncture in order to remove the immediate pressure. In the fluid was found pneumococci and streptococci. It was the pathologist's idea that the pneumococcus had been able to penetrate the bone, while the streptococcus had not, and, therefore, had become more rapidly diffused. This was a subject that should be studied more. It offered a broad field.

DR. GRUENING said that at one time the position held by Dr. Harris was maintained, but that it had since changed.

Removal of Semicircular Canals.

DR. FREDERICK WHITING reported two cases.

Case 1.—This patient was a nurse in the New York Eye and Ear Infirmary, and he saw her about five or six weeks ago. She complained of pain in her ear one Sunday night, and on Monday morning the house surgeon did a myringotomy. During that afternoon and evening there was a purulent discharge from the ear. Dr. Whiting saw her on Tuesday, when there was an extreme degree of tenderness over the entire mastoid. At the same time there was a very profuse purulent discharge from the ear. He expressed the opinion that it would be necessary to operate within twenty-four hours. At midnight she

vomited violently, and had vertigo very pronounced and of a severe type. She could not raise her head at all without immediately vomiting. When the house surgeon saw her in the morning she had a pronounced rotatory nystagmus, and fairly well pronounced vision when the eyes were fixed in the plane of direct vision. But as she turned her eyes to the left side the nystagmus became exaggerated. As she rotated them well to the opposite side, and when the upper lids were drawn from the eyeballs, the nystagmus was extremely pronounced and of violent type. He advised immediate operation, and removed the entire mastoid. The tissues contained a considerable amount of pus, and all the cells were filled with clots, granulation tissue or pus. The intercellular osseous basement substance was not broken down much, for sufficient time had not elapsed for this to occur. He removed the semicircular canals, which were filled with clot. He did not disturb the bony meatus; he did not attempt to detach the lower portion from the bony meatus. He went beneath the arch and opened the vestibule widely. The girl, as soon as she had recovered from the effects of the anesthetic, never vomited again, the nystagmus disappeared within forty-eight hours to seventy-two hours, and her complete recovery was uneventful.

Case 2.—Three weeks later he had a case at the Mt. Sinai Hospital. The patient was sent in because she was suspected as tuberculous, but all the tests made to determine this were negative. But after she had been in the hospital a few days she developed an earache, and the ear drum was incised by the house surgeon. Following this there was a purulent discharge from the ear, which lasted for several days, when the attending physician asked him to see the patient. When Dr. Whiting entered the ward he found her vomiting violently, with her head held over the pus basin, and she had been vomiting for several hours. She could not fix her eyes on anything but that the nausea became intense and she vomited; so she kept her eyes closed and her head buried in the pillow. She had rotatory nystagmus, but of slight degree, when the eyes were fixed in the line of direct vision; but so soon as she turned her eyes away, the nystagmus increased, and as she rotated her eyes to the right the nystagmus became pronounced. When he raised the eyelids from the eyeballs the rotatory movements became so rapid as to defy any attempts to follow the eyeballs. He

did the same operation on this patient that he did on Case 1.

Both of these cases made a perfect recovery. He felt that in those cases early operation saved life. In Case 2 he found in the semicircular canals and vestibule thin, shreddy clots, but there was no actually purulent material that could be recognized as fluid pus. But both vestibule and labyrinth and semicircular canals contained clots. Both the patients made an uninterrupted recovery. He felt convinced that early operation in both these patients saved their lives. He was particularly pleased with the outcome, because he thought that if they had waited a few days longer, both patients would have been lost. These cases had an acute suppurative labyrinthitis. He had operated for chronic suppurations where there had been some recognizable fistula leading to the semicircular canals, and in other chronic cases, where there was no recognizable fistula, but where the symptoms referable to lack of co-ordination and disturbance of equilibrium and the like indicated the necessity for operation; all such cases recovered. These were cases, however, of chronic suppuration.

Dr. Emil Gruening said that of course all of them had had such cases, and at one time they did not immediately enter the labyrinth. He had had a large number of such cases, with nystagmus, vomiting, dizziness; and in these cases the simple operation of mastoiditis cured the patients of these symptoms.

Last winter at the Mt. Sinai Hospital he met with three cases, all presenting these symptoms, and all were saved. They had nystagmus which was as exaggerated as that described by Dr. Whiting. He did not feel that he did too little by not opening the semicircular canals and labyrinth. He thought it was going a little too far to open every labyrinth in these acute cases with symptoms of nystagmus, dizziness and vomiting. With only clots in the semicircular canals, and no purulent matter, the patients would get well without such an operation. After the mastoid operation, if the symptoms continued, then it may be indicated to do the labyrinthine operation.

Dr. John D. Richards believed that Dr. Gruening's position was correct; he did not believe that one could tell from the symptoms alone whether or not the labyrinth was invaded to the surgical extent. Cases presenting symptoms of vertigo, vomiting, nystagmus, if there are no symptoms of meningeal invasion, would get well without this radical operation.

From a surgical standpoint, they were not the cases to be handled. He thought they were operating too frequently, particularly in those cases which gave no symptoms pointing to the invasion of the meninges and giving meningitic phenomena. A large number of cases presenting similar symptoms in the chronic cases would show at operation an old fistula leading to the capsule and labyrinth; after operation, the fistula would disappear. While the labyrinth was invaded in acute cases, it was not invaded to a surgical extent.

Dr. Arthur B. Duel believed that it was a grave question about the advisability of early operation in these acute cases; there was great doubt whether there was a suppurative labyrinthitis or not. Nevertheless he felt that sometimes an early operation might save a patient on whom a later operation would prove ineffectual. For instance, in the history of the patient from whom he got the specimen he presented, the best judgment was obtained that could be brought on it; this patient's condition subsequently improved, and he hesitated to do anything further. The labyrinthine symptoms disappeared in forty-eight hours after the operation. Later the temperature rose to 106, and she died. The specimen showed that the infection, in the meantime, had traveled through the labyrinth to the base of the brain. How would it have been had he operated 48 hours earlier?

Dr. Duel said he had in mind a case that Dr. Whiting saw with him a few days ago. The patient had an earache late at night; at 4 a. m. he sent to him and asked what he should put in his ear. Within one hour Dr. Duel opened the middle ear because there was a bulging drum. A smear from the discharge showed pneumococci. The temperature was normal for the following twenty-four hours. Then he was hastily summoned on the following morning, because the patient had been vomiting since 2 o'clock. He was very dizzy, and he could not turn in bed without vomiting. By burying his ear in the pillow he could keep from vomiting; but it recurred on the slightest movement. When he turned on his back and looked straight, there was a marked rotatory nystagmus toward the sound side; when he directed his eyes away from the affected ear the nystagmus became very violent. He had no temperature. He showed complete deafness on that side to tuning fork and voice. A few hours later Dr. Whiting saw

the patient with him. At 5:30 that afternoon, both agreeing that it was wiser to operate, they operated and found that there was no circulation in the labyrinth. Within twenty-four hours the temperature rose to 107 F., and the patient died from a meningitis.

DR. EMIL GRUENING said that Dr. Whiting might have had two successful cases of early operation in acute diseases, but there were hundreds of cases which had recovered without labyrinthine operation. He thought they might induce a purulent meningitis by operating on the labyrinth when there was a purulent condition in the mastoid. He believed that they should refrain from operating upon the labyrinth at first; attack the mastoid, and then a few days later, if necessary, operate on the labyrinth.

DR. DUEL said that Dr. Whiting had examined the fundus in both eyes and found them congested. This had been taken as an added indication for early operative interference.

DR. EMIL GRUENING said that in many cases dizziness and vomiting were not due to labyrinthine disease, but were due to the meningitis; vomiting and dizziness were the first symptoms of a meningitis. If they merely entered the labyrinth they made a great mistake.

DR. WHITING said that Dr. Duel's experience in the case he reported simply corroborated his own views in the matter. He thought that what Dr. Richards said in regard to the chronic suppurative processes was entirely true. Even if one got manifestations associated with deafness, as in the case Dr. Duel saw, it did not give positive indications that the labyrinth was involved; but the probability was that, if there was not a suppurative process at that time, it speedily would become so. If the patient was to have a chance to get well, early operation offered the best chance of all. That was his opinion at the present time.

Dr. Gruening had stated that hundreds of cases recovered without operation, but Dr. Whiting said he was not in a position to question that statement; he simply stated that only within a recent period had they taken note of and observed these cases with any degree of accuracy whatever. If a man stated that he had seen so many cases, he accepted that statement in proportion as his memory was accurate. With a train of certain symptoms associated with tuning fork perception heard only on the opposite side of the head, that was,

when the tuning fork was placed over the mastoid on the affected side the patient indicated its perception in the opposite ear, under these conditions he thought it was a fair assumption to say that there was labyrinthine involvement. From the experience he had had, he felt that in the presence of certain symptoms, with deafness, you had positive evidence of suppurative inflammation of the labyrinth; to open the labyrinth skillfully and promptly, exposed the patient to less risk than if he was left after a simple mastoid operation, in the hope that the process would not go further. The same rules, however, did not apply to the chronic suppurative cases. In many cases, where there had been more or less vertigo, disturbance of equilibrium, these symptoms had disappeared after operation; but that did not mean or prove that the labyrinth was not the seat of suppuration; it meant that it was out of business. Patients might die of meningitis without warning months or even years later. Sometimes he felt that there was urgency in the chronic cases; but in the acute cases he believed they exposed the patient to greater risk in not doing an operation than when they performed such an operation.

DR. GRUENING wished to have it recorded that he did not agree with the views expressed. Those acute cases would present the symptoms of dizziness, vomiting and nystagmus, and when a thorough mastoid operation was done, the symptoms would disappear in the great majority of the cases. In his own experience every case recovered. A large number of similar cases were seen at the Mt. Sinai Hospital; they were not subjected to the labyrinthine operation and all recovered. With this experience he thought they were doing too much when they attacked the labyrinth. In Dr. Whiting's cases there might have been a serous effusion, an hyperemia, or a hemorrhage of the labyrinth; but these conditions did not call for opening the labyrinth.

DR. DUEL asked Dr. Gruening if he recalled some cases in which meningitis rapidly developed following a simple ear suppuration, and death within two or three days.

DR. GRUENING said he had, when there were labyrinthine symptoms. But the symptoms were different. Dizziness and vomiting may be due to the meningitis which causes death. He referred to those cases with nystagmus, deafness in one ear and vomiting. When there was dizziness and nystagmus present, with deafness in one ear, he made a favorable prognosis.